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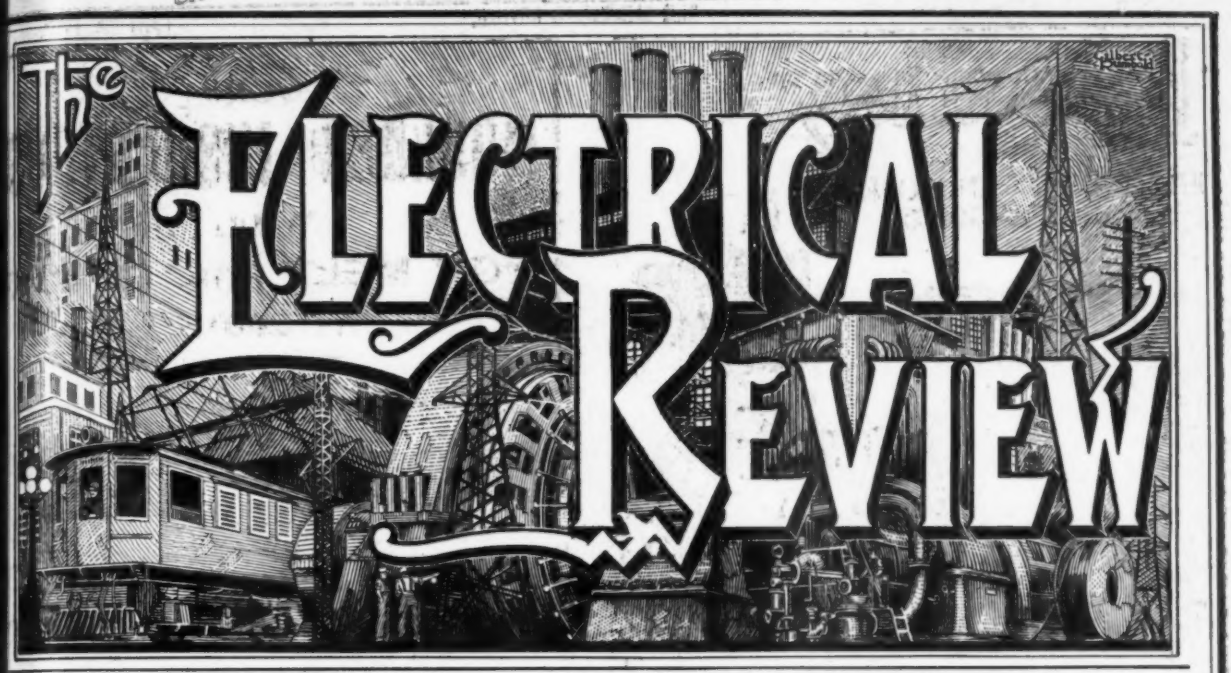

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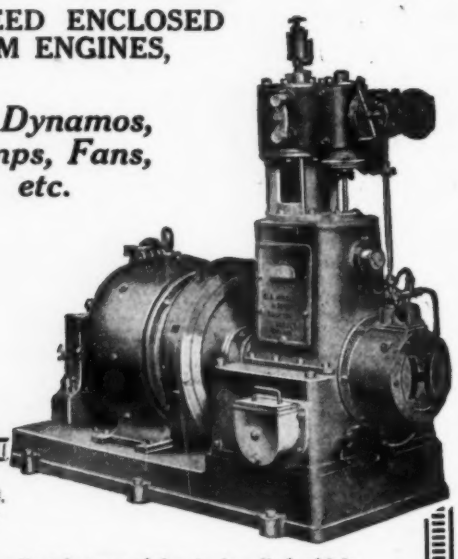

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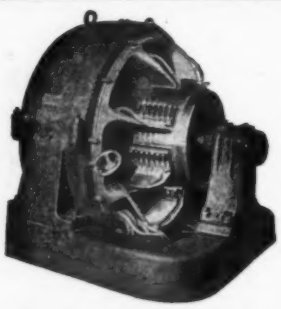

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THE
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VOL. XCIII. JULY 20, 1923. No. 2,382

ELECTRICAL REVIEW.

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THE ELECTRICAL REVIEW.

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Joint Managing Directors: G. H. ALABASTER. E. A. GATEHOUSE, M.I.E.E., A.M.INST.C.E.

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WHEN THE CLOUDS ROLL BY.

To feel the pulse and take the temperature of the electrical industry is not the easiest thing in the world at the moment. The pulse is under the influence of excitement or depressing influences, and not all the thermometers can be relied upon. Furthermore, not everybody who affects to do so knows how to record the heartbeats accurately or exactly where to place the thermometer so as to ensure that it shall tell the truth and nothing but the truth.

For such reasons do we find different men telling very different stories. Some are concerned with large affairs which look promising and others with small ones which are not prospering. Some are connected with companies which have managed to maintain good dividends; others with undertakings which reduce them or pay none; others with concerns which are writing down capital in order to resume a semblance of prosperity; others with small businesses which circumstance hurries relentlessly to Carey Street; others, and these are many, with houses which are sure there's a good time coming if we wait a little longer or if only this or that event will happen or this or that cloud pass.

We have tried this feeling the pulse of the electrical industry many a time. We listen with interest to what others have to say regarding the course of events in different departments, but generally beneath the surface we possess a calmness and composure because we have confidence in those who are at the helm of concerns which are so deeply interested in the prosperity and expansion of the industry, and because electricity itself carries the spirit of victory along with it. Who that has watched day by day, year in year out, the growth of the electrical industry throughout the world, and its adaptation to every new turn of events until it has become the colossal thing that it is, can have anything but a great faith and an unquenchable hope, truly based, with regard to the future?

Yet, temporarily—and we must all admit it if we take the large view of things and do not limit our study to our own little mud heap—there are clouds which overhang us all, and until these and their menace pass we cannot march forward with the buoyancy and energy that the industry and its inherent possibilities justify.

The principal cloud at the moment is the European situation; it is that influence, as Mr. Hugo Hirst and other manufacturing chairmen have lately stated with emphasis, which holds up the credit of the world at a time when what we most need is confidence and peace. Statesmen and others are continuing to strive with and trying to solve the problem so that the clouds shall roll away. Respecting the electrical industry itself, if we can separate it from this complex international situation, we find that the general trend of the observations of Mr. Hirst as the spokesman for a vast organisation whose growth we have witnessed from its day of small things until to-day, when it covers the whole gamut of electrical engineering, and has a capital of £9,000,000 with a year's net profit of £751,486, is that things are actually on the mend. We believe he can be trusted to feel the pulse and apply the clinical instrument with proper care. While, looking over the whole range of electrical manufactures, he does not anticipate a "boom" or immediate "bursting prosperity," he believes that we are sailing into calmer waters. But the outlook is not so clear as to allow him to overlook the possibility of some "nasty squalls" being experienced before we get there.

An increase of 33⅓ per cent. (£167,670) in profit from trading sounds a very good result for a year which contained some months of very unsettled industrial conditions. It is more satisfactory still to hear that during recent months there has been a further advance, and that the number of employés has increased from 15,000 to 15,814 since March last. But the increased profit and employment have to be considered in relation to volume of turnover. This must have been considerably greater than in the preceding year, for Mr. Hirst estimates that there has been an all-round drop in prices of at least 20 per cent. In order to make even the same profit as in the previous year, a greater volume of work had to pass through the factories and selling organisation and the actual net profit is £200,000 better than for the previous year. An example was quoted of one branch of the business which during the year transacted 314,000 orders of an average value of £4, compared with 255,000 orders of an average value of £4 18s. 6d. in the preceding year.

It is that one dark cloud—the Ruhr problem and all that it stands for—which prevents unrestricted progress of the company and delays general world recovery. There is no question that the sympathies of the bulk of the British nation lie with France in respect of reparations, but Mr. Hirst, in his speech, referred to the danger and uncertainty that the present situation involves.

The chairman indicated important measures which the General Electric Co., Ltd., is constantly taking in the organisation of its facilities for electrical applications in all industries, in research, in expert personnel, and so forth, so that it shall be in full readiness for future developments in all parts of the world when they occur. It has works capacity for giving employment to double the present increased number of employés when the real forward movement takes place. But for the unsettlement in Europe the rate of advance would have been much more rapid, and we may hope that our statesmen will succeed in elaborating and making effective a policy which shall lead in the most desired direction without any adverse consequences on trade here and in other friendly countries as an outcome of a settlement "in kind" which, if the goods are not absorbed by France, may lead to the flooding of the world's markets with products at a price which pays no regard to the cost of production prevailing here and elsewhere.

There are, of course, some smaller clouds which have little to do with the international situation. Some of these, perhaps, the industry can roll away without outside assistance, given a general desire and a congenial atmosphere. The weakness of the electrical retailer, as the Electrical Contractors' Association has lately indicated, is a weak place in the whole electrical armour, and it may be that measures may yet be possible to do something to avoid the avalanche of small failures by discovering a new way to pay current debts. Occasion may arise for us to return to this subject.

Film Propaganda.

THE kinema to-day probably holds more potentialities as an educational medium than any other means, and it is being used more and more for this purpose. As was mentioned in a recent issue, a film exhibiting the merits of a well-known wiring system was shown at a London kinema during the whole of one week, and we took the opportunity of seeing it. To invest such a subject with interest to satisfy people who have paid for admission is not an easy task, and managers who have to study box-office returns are likely to be very cautious in this respect. We may therefore conclude that "Wiring In" was considered of sufficient merit to justify its inclusion in the ordinary programme of the show.

As to the plot—this, in consonance with its subject, was simple and unobtrusive. It was based principally on the trouble associated with gas lighting—inaccessibility, matches, and mantles; it was the story of a husband who found that it was as much trouble to himself as to his wife, and decided to change over to electricity, remarking, rather hypocritically, that "Love will make any sacrifices." The film showed very plainly the ease with which the system is installed, although we are bound to remark that the speed of the wiremen was unnatural. The photography was not up to the best standards, but this was no doubt due to the inadequate lighting of the interiors, which, after all, was an essential feature of the first part of the film.

We should like to see this idea extended, for propaganda enters very largely into the majority of films which are neither of a purely dramatic nor farcical nature. The principal difficulty appears to be the effective concealment of the "pill" in the "jam," but this can easily be arranged by those who are fully acquainted with the tastes of the public in consultation with the technical experts.

The British Engineering Standards Association.

AT the annual meeting of the Association on Thursday last week, the chairman, Sir Archibald Denny, in reviewing the work done during the past year, drew attention to the question of finance. It appears that the B.E.S.A. is confronted with a deficit of some £1,700, and Sir Archibald expressed the hope that both the Government and the industries of the country would take steps to establish the finances of the Association on a sounder basis.

With this appeal we are most heartily in sympathy. It is indeed regrettable—though not, unfortunately, singular—that an Association such as this, the work of which has been of the greatest value to the nation, should have to complain of the niggardly support that it receives from those who profit by its labours. To enlarge upon its merits is superfluous, for every one knows that its efforts are devoted to the simplification of plant and the standardisation of products, in order to promote economical production and thus to enable this country to compete successfully in the markets of the world. Obviously, the Association seeks no profit for itself; on the contrary, it is dependent on the voluntary work of some 2,000 engineers for the results which it achieves, and those results are placed at the disposal of the whole of the engineering and allied industries free of charge (for the trifling amount paid for copies of the specifications does not cover the cost of paper and printing). The services of the Association are so highly appreciated that pressure is constantly being exerted upon it to widen the range of its activities, and the questions which it is called upon to solve are increasing in number and complexity—yet neither the Government, of which many Departments are indebted to it for valuable assistance, nor industry in general, which is still more deeply beholden to it, appears to realise that such an organisation cannot be efficiently carried on without adequate funds.

There is no occasion for compulsory measures to solve the financial problem; if every firm were to contribute one-tenth—or even one-hundredth—part of the value received by it from the work of the Association, the revenue would amply suffice to meet all outgoings. It is up to the many firms, companies, and undertakings which hitherto have taken all that came and made no return whatever, to mend their ways; if the *average* annual contribution were only £2 each, we believe there would be no lack of funds to carry on the excellent work of the B.E.S.A. The obligation should be none the less binding because it is a moral obligation.

Prospectuses.

A SHORT time ago we issued a warning here advising electrical readers to place their friends on their guard respecting optimistic prospectuses which promised large profits to investors in new wireless businesses. If we

had never said anything editorially about the matter, the electrical reader would have been able to judge from subsequent events recorded under "Bankruptcy Proceedings" and "Company Liquidations" whether or not the situation was attractive enough to justify a plunge on the part of his friends. Unfortunately, the course of events, which has been so disastrous from some points of view, still fails to hinder the private circulation of prospectuses. Three—one wireless, one generally electrical, and one relating to electricity supply—have recently been the subject of adverse comment in the financial Press. Little information appears to have been given regarding business results or other points upon which a careful investor bases his decision. We do not make any pretence to reach the non-electrical man in the street or in the country village as a general rule; further, we fear that many of the people who receive and respond to such prospectuses are not close readers of the financial dailies. But our readers, when appealed to, should put their friends on their guard, for the excellent electricity supply results of some undertakings and the glamour that surrounds broadcasting have formed an irresistible inducement to activity on the part of those who, while anxious to avail themselves of a psychological moment and a favourable atmosphere for their issues, find it inconvenient to tell the complete story when they ask for the financial co-operation of the uninitiated.

German Loan Redemption.

As has been previously reported, German companies in general are availing themselves of the depreciation of the mark in order to release themselves from the loans raised in gold prior to ten years ago by notifying the holders of the intention of the companies to redeem the loans in paper marks by a fixed date. As the Government has followed or is following the same policy in the matter of internal State loans, the holders of loans (obligations or debentures) in private companies have naturally failed in their efforts to secure Government intervention with a view to their private claims being paid off in gold instead of in paper marks as is proposed. We note, however, that two companies have decided to make concessions to the holders of pre-war loans. Thus, for instance, the Berlin Company for Electrical Undertakings has resolved to redeem certain 1,000 gold mark bonds by the payment of 20,000 paper marks per bond, and other issues at 15,000 marks per 1,000 mark bond. In a second case, which concerns the Berlin Light & Power Investments Company, the method of compensation decided upon is different from the preceding case. The company proposes to issue free to the bondholders one new share for each bond or amount of 10,000 marks of one issue, one share for each bond or amount of 30,000 marks of a second issue, and one share for each amount of 50,000 marks held in a third loan raised as late as 1922.

English Firms and Swedish Contracts.

APPARENTLY English firms are not being invited to submit tenders for the supply of a number of electric locomotives to be used in connection with the electrification of the railway between Stockholm and Gothenburg. This assumption is based upon a Stockholm report that the programme for the locomotives has just been placed before all Swedish firms that are considered to be in a position to effect such deliveries; the German firms of Siemens-Schuckert and the A.E.G.; and before two American firms. While it is uncertain where the orders will be allotted, it is stated that both the Council of State and the Ministry of Communications have given the railway managers instructions that the contracts are to be carried out by a Swedish firm "only on the presumption of an acceptable offer."

China's Electrical Imports.

THE report for 1922 of the Inspectorate General of the Chinese Customs recalls that Chinese imports of electrical materials increased in value from 5 million taels in 1919 to 6.3 million taels in 1920 and 13.2 million taels in 1921, but it has to be remembered that these figures do not give a clear indication of the value owing to the large drop in exchange which occurred between 1920 and 1921. The report notes with regret that this advance did not continue last year. No doubt, it is added, the surfeited condition of the market in these articles, resulting from overbuying during the last two years, coupled with the general depression in trade and a falling silver exchange, explains the contraction in value of electrical materials imported in 1922 to 9.4 million taels. Despite this set-back, the Inspector-General of Customs maintains that there is a bright future in China for electrical machinery, fittings and supplies generally. During the year important contracts were secured for extensions to existing plants at Chefoo, Swatow and Tientsin, while the power stations in several other cities, such as Hangchow, Chinkiang, Pengpu, and Canton were all considerably extended, testifying to the increased use of electricity throughout China. British electrical manufacturers will be encouraged to learn that an interesting change is gradually becoming apparent in the attitude of buyers of electrical materials, who now lay greater stress than in recent years on efficiency and reliability—a significant advance on the day when inexperience resulted in the purchase of cheap and unreliable machinery.

Reorganising Electricity Supply.

MR. F. W. PURSE'S paper on this subject—under a title which failed to indicate the nature of its contents—before the Incorporated Municipal Electrical Association came at an opportune time; as he points out, the work to which the Electricity Commissioners have laid their hands will in many places involve a change in the system of distribution, and supply engineers who are confronted with the problem of utilising their existing material and plant to the best advantage will find much useful information in the paper and discussion.

Dr. S. Z. de Ferranti, whose pioneer work has tended to identify him with single-phase practice, laid the utmost stress on the importance of uniformity to the electrical industry, and with that end in view gave cordial support to the extended use of three-phase current at 50 cycles per second; but he recognised the costliness of converting long-established d.c. systems to a.c., and hinted that they might very well be left alone for the present, in view of the possibility that before very long the means of converting a.c. to d.c. and *vice versa* might be greatly improved—even going so far as to quote Lord Kelvin's views in favour of high-pressure direct current for long-distance transmission.

Dr. Ferranti obviously had in mind the thermionic valve and its congeners, which have already proved their suitability for conversion on a moderate scale, and have unlimited possibilities before them. In our issue of September 29th, 1922, we gave particulars of tests of mercury arc rectifiers at pressures up to 5,400 volts, dealing with a power of 1,620 kW per cylinder, which would be suitable for railway traction; and the thermionic valve is in course of development to convert 1,000 kW per valve either from a.c. to d.c. or d.c. to a.c., as described in our issue of December 15th, 1922. It is, therefore, highly probable that at no distant date the supply of d.c. networks from a.c. generating plant will become a simple and comparatively inexpensive matter. Moreover, it will also be possible to change the frequency of an alternating current, without the use of motor-generators aggregating twice the power they deal with. Vast changes have taken place in electrical engineering during the past 30 years; but there is no sign of finality being even approached—the world of 1953 will be a very different place to that which we know now.

D

WATER-POWER STUDIES.—IV.

Storage and Pondage.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E., M.Am.Soc.C.E.

(*Concluded from page* 53.)

Usually low head developments depend on a perennial stream flow with sufficient storage or pondage capacity to handle hourly fluctuations of load. In general, day to day or weekly storage for low head developments is commercially impossible for a large or fairly large power output, due to prohibitive cost of land and of structural works necessary to impound the vast amount of water to carry over this period. For pondage, if we know the flow of a stream and know that the mean head lasts for nine hours (rather a long time-period), then if the pondage is of sufficient capacity to handle this flow for one day of 24 hours, the turbines can use not only the water flowing for the nine hours full operation, but also the amount which has flowed into the reservoir or regulating basin for pondage during the remaining fifteen hours' inoperation; the available energy could thus be increased $24/9 = 2.7$ times. Hence, we can assume that natural rates of stream flow can be modified by pondage of almost any useful amount; for high head developments a relatively small amount may be of extreme value. While *storage* means the capacity which may be available to increase the extremely low flows for several days, weeks or perhaps months, *pondage* generally means the water storage capacity which is available for a shorter period of time, such as part of a day of 24 hours, and used for the purpose of equalising or regulating the variations in the power load during any one day. The amount of pondage required in any given case depends upon the load factor and character of load, and it may limit the size of plant for any predetermined load factor. Natural conditions at the site, coupled with excessive cost, will often decide whether it is the hourly or daily load factor or the load factor for any longer period of time which determines the amount of pondage. With restricted pondage or no pondage at all, the hydraulic equipment of an independently operated plant must obviously be operated as a *base* plant carrying as much of the load as possible up to its full capacity. Stream flow may not correspond to the variation in power demand during the day, thus necessitating regulated pondage as an important component of the economic regulation of flow. Where pondage is used, flashboards should preferably be provided for low head developments to raise the normal level of water. The use of flashboards often proves a valuable asset, particularly for *very* low head plants, because the controlling factor is head variation. As the head falls with the drawing down of the level of pondage water, the power and efficiency of the turbines fall if the speed is kept practically constant, which is the desired operating condition for constant frequency of alternating current generators and motors. Pondage should always be located as near the power house as possible. Very often excellent storage and pondage facilities are available at relatively less total cost for a given total capacity, but their location is so far up-stream or so far from the penstock, that full advantage cannot always be taken of the available water for economic and dependable regulation. With medium and high head developments the forebay is usually built for pondage and regulating purposes. It is sometimes suggested that the forebay should be designed to store a half-day's or a 24-hour supply of water so that the plant can be employed to carry the *base* load running at about 80 per cent. load factor all the time.

The amount of power that can be developed during the period of *lowest* flow, sometimes defined as the amount of energy which is available for every hour of every day of every year, is seldom taken as the amount upon which hydro-electric developments are based. This power basis (modified in form) is usually defined as the *primary* power. For every water-power development it does not necessarily signify the amount of power for 8,760 hours of the year.

The *gross* annual energy output in kW-hours is expressed thus:

$$\text{kW} \times \text{load factor} \times 8{,}760,$$

$$\text{or kW-hours} = P\ n\ f\ c\ t',$$

$$\text{and h.p.-hours} = P'\ n\ f\ c\ t';$$

wherein:

P = kilowatts; and P' = h.p.

n = number of hours per year.

f = load factor.

t' = average per cent. of time available.

c = coefficient. This is the value by which the total energy is reduced to make allowance for varying efficiencies due to:

1. Character of the load.
2. Actual variation in daily load factor from the value of load factor assumed.
3. Leakage and waste, &c.; from 10 to as much as 40 per cent. may have to be allowed for this. The latter value would be that of a poorly designed, constructed and operated hydro-electric system.

Storage or secondary power is often based on the continuous available power for about 100 days up to perhaps 180 days (six months) of the year, the period of time varying with the amount of storage, dependability of water, the probable use of the power, the diversity of demand and the load factor of the system. Different to the secondary power, primary power (which is for continuous service) always demands a higher degree of insurance; in fact, the former class of power (neglecting interconnection of plants) is rarely sold with a guarantee. Moreover, it simply represents the amount which is developed above the primary power and therefore available only for intermittent service, this being the chief reason why it can be sold cheaper. Very often the amount usually known as secondary power is many times that of primary power, and can be effectively utilised for industries not requiring continuous plant operation, or it can be used very effectively in connection with electrical operation of plants situated on streams of different run-off characteristics. This class of power may also be represented by the excess of generating rating over that required for primary power, and can be delivered in varying amounts on most days of the year.

As already explained, but in different words, reservoirs are limited by insufficient storage capacity and by cost. Conditions may require that the reservoir be operated to utilise practically all the available storage each year without any special regard for maintaining a definite minimum regulated flow; or, conditions may exist where it is necessary that a predetermined minimum flow be maintained, the aim being to utilise the available storage to increase the dependable flow. Perhaps the object would be to obtain, as near as possible, the highest minimum flow and at the same time use each year practically the whole volume of available stored water. The two methods employed to increase primary power and *dependable* flow are: (*a*) Utilisation of available storage to secure the maximum possible increase of the *lowest* flow or extreme low-water flow over a period of time; (*b*) utilisation of available storage to secure the maximum increase in the *ordinary* minimum flow or ordinary low-water flow. The variation in stream flow

(from flood to lowest flow) is usually so great that it invariably pays to install hydro-electric plant capacity sufficient to utilise much more than the estimated low-water flow of the stream. Flood and low-water extremes can be modified by the retardation of precipitation in its movement toward the streams; the principal agency being porosity of the soil. The retardation of flow in one form or another will generally help to increase

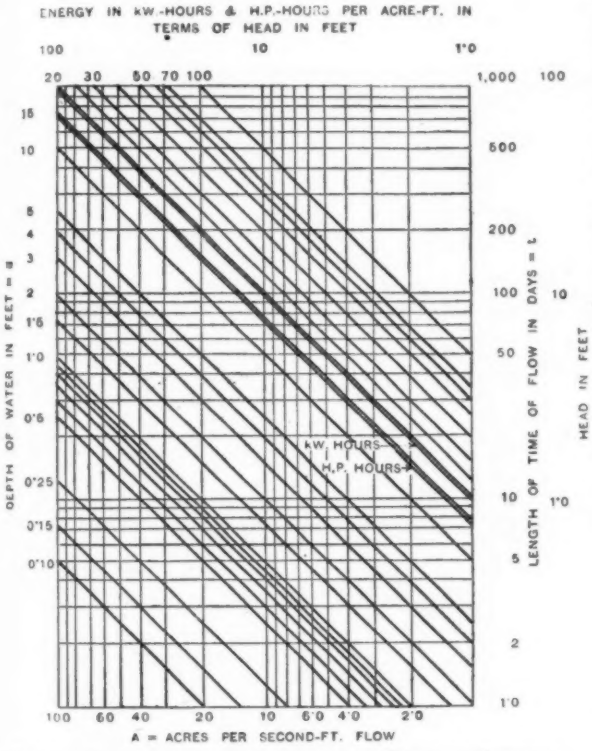


Fig. 9.—Storage, Flow and Energy, in Terms of Depth of Water, Acres per sec.-ft. Flow, and Head in Feet.

Example :—A conduit or a stream with an average discharge of 200 cusecs (second-ft.) is to supply a regulating basin (forebay); the pondage has an area of 132 acres. The problem is to find how many days, or part of a day, it would take to fill or empty this area to a depth of 3 ft.

First obtain the value A'/Q=area in acres per cusec, then, from fig. 9, follow up the vertical line for 0.66 acre per cusec until the diagonal line d (3 ft.) is intersected. Then, for this example, move to the left of chart to 6.6 acres and follow up the diagonal line for 3 ft., we find the flow in days to be 1.0 day (24 hours) for 0.66 acre, or 10 days for 6.6 acres per cusec, that is, the time for filling is—

$$t = 0.66 \times 3 \times 0.5041 = 0.998 \text{ day, } \textit{say 24 hours.}$$

If we desire to know what the depth in feet will be for an average discharge of 200 cusecs (second-ft.) from a stream flowing continuously for 24 hours or longer, the answer can be obtained from a glance at fig. 9, or from the formula :—

$$d = \frac{t \times 1{\cdot}9835}{A} = \frac{0{\cdot}998 \times 1{\cdot}9835}{0{\cdot}66} = 3 \text{ feet.}$$

Or, if we know the draught-head and have assumed the length of time, then the area in acres for pondage can be found from fig. 9 or from the formula :—

$$A = \frac{t \times 1{\cdot}9835}{d} = \frac{0{\cdot}998 \times 1{\cdot}9835}{3} = \frac{0{\cdot}66 \text{ acre}}{\text{per cusec}}$$

making $0.66 \times 200 = 132$ acres (pondage).

Other important uses may be made of this chart.

dependable flow, *i.e.*, the maximum and uniform power which can be depended upon at all times in all or most years. Apart from retardation of precipitation due to porosity of the earth, regulated flow from reservoirs is *the* principal agent for mitigating flood and low-water extremes of streams.

The capacity of the material of the water-bearing stratum to transmit water depends mainly on the effective size of grain and on the porosity of the water-bearing material. Experiments have shown that the flow of water through any material varies nearly as the square of the effective size of grain. The flow of water is also greatly increased with an increase in porosity. The water table is defined as the surface below which any extended body of porous material is completely filled with water. The water table of an underground reservoir corresponds to the surface of an ordinary surface-reservoir. The underground reservoir of streams usually sustains the normal low-season flow for several weeks during a total absence of precipitation, and the rate of depletion is often very low. It is known that streams frequently discharge an inch or more per month from the catchments without addition of rainfall or precipitation; this is more particularly true of the summer period when rainfall seldom affects the ground water reservoirs. From a study of the percentage relation of run-off to rainfall, it is sometimes found to vary materially in two years having practically the same total precipitation; the factor principally responsible for this variation is the relative height of ground water level, and to form some idea of the amount added or drawn from ground water reservoirs or storage, it is first necessary to collect such information as may be available regarding the general changes in height of water surface in existing wells, marshes, and so forth. This part of water storage study and investigation is very important, and, unfortunately, is nearly always uncertain in character.

As regards storage of water in the earth, percolation and capillarity are of special consideration in that they bear a relation to the important factor of run-off. Peat and muck soils have a high normal water content due partly to their humous composition, which gives them a greater affinity for water than the common material soils, and partly to the large relative pore space accompanied by a high degree of capillarity. Part of this pore space is in the loose character of the soil itself and part in the cellular structure of the muck. Part of the water held by saturated muck is released readily by drainage and about an equal amount is quickly re-absorbed by drainage soil when moisture is supplied by rainfall. Soil storage, with particular reference to this class of soil, may be summed up in the following words: (1) Storage capacity of the soil under favourable water table conditions will permit taking advantage of evaporation to assist drainage; (2) value of this storage varies directly as the depth of soil above the table water; (3) storage capacity of muck soil is a valuable drainage factor; (4) soil storage tends to equalise run-off, and this effect will extend throughout the hydraulic system of waterways; (5) deep soil above the water table is a good protection against flood, &c.

The rate at which muck, silt, &c., is deposited in a reservoir depends upon the quantity carried by the stream, the size of the reservoir, the volume of stream flow, and the character of the catchment area. If the capacity of the reservoir is small compared with the average annual discharge of the stream, it will act in the nature of a retention basin, and when the stream is in flood and carries its greatest load of muck or silt, a portion of the muck or silt goes over the dam. On the other hand, if the reservoir capacity is large compared with the annual stream flow, little goes over the dam, and the muck and silt brought down by the stream is deposited in the reservoir.

Professional Classes Aid Council.—The second annual report, covering the year 1922-23, shows that the number of applications for assistance was about the same as in the previous year—627. Advice was given in 296 cases, and financial help in 109. Of the remainder 158 cases were outside the association's scope; 23 were "unsatisfactory"; 33 applications were withdrawn; and 8 remained under consideration. Although a deficit of £2,213 is shown in the income and expenditure account this is an improvement, as last year there was an adverse balance of £5,903. The increased income included a donation of £1,000. The report states that the amount of aid which the Council is able to afford is severely limited by its lack of funds, and an appeal for assistance is made.

THE WIRELESS CRAZE IN THE FACTORY.

By ROBERT STELLING, Dipl. Eng., F.C.W.A.

Life is just one thing after another, and the manufacturer of electrical instruments and apparatus is just now finding a new trouble succeeding the many of the past. The craze for wireless telephony is making itself felt in such factories in a very unpleasant way. In consequence of the extraordinarily good value which can be obtained for small parts for the manufacture of wireless receiving sets, much time is being wasted and material purloined in the illicit manufacture of small components in factories. One recalls the story of the prominent Birmingham aeroplane manufacturer who was in the habit of personally engaging all new labour, or, at any rate, of taking an opportunity of interviewing applicants. It is recounted of this gentleman that his first question was: "Have you made your petrol lighter? If not, go back and make it, and then come back here to make your application"; and apparently we are threatened at the present time with the manufacture of wireless components on a similar scale to that of petrol lighters during the "munition" period.

Various stories are to be heard from all quarters. One hears of machine-shop foremen being discharged and prosecuted; of raids by the police, and more than a dozen men being escorted away in taxicabs; and one cannot help feeling that something is radically wrong when this state of affairs is allowed to arise. Obviously it is impossible to draw or to apply an inflexible rule, and, to a certain extent—but to a very small one—manufacturers are compelled to overlook the manufacture of "foreigners," particularly by apprentices, in a small way, provided that such articles are only turned out from scrap, and do not interfere unduly with production. Indeed, it would be almost futile to try and stamp this sort of thing out altogether, but in no modern factory should it be possible for large-scale theft of material or misuse of time to occur to the extent which is now being experienced.

Taking first of all the question of material, a modern stores control system should take care of this. In a modern system, material is only issued from the stores on the authority of the planning department, and reissues due to losses or spoiled work are so arranged that they are most carefully scrutinised. It is perfectly possible, with the co-operation of the foreman, to ensure that only live material (that is to say, material actually required for jobs in hand) is allowed out on the benches or at the machines. The Perpetual Inventory system enables the storekeeper to be checked at any time, and in this connection a system of Perpetual Control enables such a check to be carried out.

Manufacturers do not appreciate the value of Perpetual Control as the logical sequel to Perpetual Inventory. Perpetual Control means the examination daily of a small percentage of stores bins, followed by a comparison of the figures with the Bin Card and with the Material Ledger Card. If only 1 per cent. of the bins are examined daily, then all the bins will be examined three times a year, which gives a far more satisfactory result than the annual stock-taking, in the first place because it must be more accurate, and secondly, because the storekeeper never knows which bins are next on the list for inspection, but is always kept alive to the fact that at any moment discrepancies may come to light.

Coming next to the time question, if every man's work were planned by a properly-organised Planning Department, it would be nearly impossible to divert labour from production to illicit work to an extent that would make the latter profitable. A Planning Department must work upon standards of time, and in the factory where the manufacture of such small parts is possible, these standards of time are usually very easily achievable with a high degree of accuracy. It follows that if the Planning Department finds that its programmes are breaking down, an inquiry can be at once instituted in the right quarter, and an examination of the Job Cost Cards will show by what amount the time booked on any job has varied from the standard rate shown. A modern "Wages Control Account" effectively ties up the loose ends in this direction also.

With such relatively easy methods of checking the expenditure of material and of time available, it is astonishing indeed that pilfering and misuse of time have become possible. A benefit may, however, arise out of this evil, if the manufacturers affected realise that controls such as are suggested above will not only prevent this trouble, but will also contribute to economy and effectiveness in the normal running of the factory.

EAST MIDLANDS ELECTRICITY DISTRICT.

Electricity Commissioners' Inquiry.

The main lines of a scheme propounded by the East Midlands Electricity Advisory Board having been settled at a preliminary inquiry, which was held at Nottingham in January, attention was directed by the Commissioners (Sir Harry Haward and Mr. A. Page) at the resumed proceedings there on the 10th inst., to the details of the project. The Board was represented by the Town Clerk of Nottingham (Mr. W. J. Board) and its chairman (Ald. E. Huntsman, of Nottingham), Mr. W. Craig Henderson, K.C., appearing for the Notts. and Derbyshire Electric Power Co., and Mr. J. G. J. Dalton, sitting as legal adviser to the Commissioners, who dealt consecutively with the various sections of the draft order, the consideration of which formed the subject of the further investigation.

Mr. W. J. Board, having directed attention to the fact that the authorities concerned might desire the attendance of their town clerks at the meetings of the Advisory Board, asked that the necessary permission should be given. Regarding the representation of the smaller towns upon the Engineering Committee, Mr. Board pointed out that the Committee would consist of representatives of Nottingham, Leicester, Derby, and Burton-on-Trent, and the Power Co., plus one. The smaller authorities would be outweighed by five to one and the Conference felt that this would not be equitable.

Mr. Board further asked that the Derby and Burton stations should be included with Nottingham, Leicester, and the Power Co.'s station at Spondon, to form the principal generating stations for the district, to be extended as might be afterwards determined. The Order, in its present form, provided that the Derby and Burton stations might be extended to "a limited amount." The Conference felt, however, that adequate consideration had not been given to the cases of Derby and Burton, although both had excellent water supplies for condensing purposes, and their works were capable of considerable extension. He suggested, therefore, that they should be included in the same paragraph as the other and larger stations.

The Chairman emphasised the consideration, however, that the effect of the Order as it stood was not to dub Burton and Derby as second-class stations, although they were not included with the other three.

Mr. A. Page inquired whether the application was put forward because of the susceptibilities of Derby and Burton.

Mr. Board replied that that was not the case, but they thought their extension might be unduly limited.

Mr. W. Craig Henderson, dealing with the effective use of the generating stations, asked for powers to supplement the present scheme with regard to Mansfield, pointing out that the Notts. & Derbyshire Electric Power Co. had already laid cables from Spondon to Heanor, and was going to Sutton-

in-Ashfield. It now proposed to duplicate arrangements, *via* Ambergate, with a view to supplying the Matlock-Bath area.

As an alternative, Mr. Board advanced the suggestion that the Electricity Board should be instructed to prepare a full scheme of transmission lines and to submit it to the Commissioners within six months.

The CHAIRMAN said that the Commissioners were anxious to avoid doing anything which was calculated to interfere with the harmonious working of the various parties forming the Advisory Board, and were not disinclined to fall in with the idea which had been advanced. It was readily conceivable also that the position of Newark might become of a specially pressing nature. The authorities at Newark had already applied for a Special Order, and were considering the best way of obtaining a supply.

Mr. BOARD intimated that the Conference was ready to discuss the question of Newark at any time. Nottingham had been asked by Newark to quote terms for a supply, and the report of Mr. Rider, the Corporation's expert, had already been received.

Mr. HENDERSON, who expressed doubt as to the successful outcome of any meeting between the East Midlands Board and the Power Co. as to the lay-out of transmission lines, pointed out that since the last inquiry was held the company had laid 31½ miles of cable. Unless the Board started with the mains defined in the scheme, the Board would not function.

The CHAIRMAN having again urged the desirability of the parties concerned going into conference in relation to the matter, added that it would be an unhappy augury for the success of the Board if from the very outset there was to be wrangling. He thought, however, that Mr. Henderson was unduly apprehensive. The Board had already made certain advances since January, and had that day accepted the principle that transmission lines should be laid as far as possible through the districts in which the potential load existed.

After further discussion, it was determined that a consultation should be held to see how far agreement could be arrived at between the parties regarding transmission lines, and that the Order should be held in abeyance for a month, the chairman pointing out that the company was in a strong position as it alone had the powers to lay these lines. It only remained for the municipalities to work harmoniously with it in order that the inter-connections between the towns might be rendered profitable to both parties.

Direct representation upon the Advisory Board was sought by the Councils for Ilkeston, Ripley, Heanor, Belper, Heage, Wirksworth, Repton, and Shardlow, the importance of the application being enforced by the consideration that a total population of 136,000 was involved.

Mr. BOARD opposed the application, urging that the interests of the parties affected would be well looked after by the County Councils, all of which had direct representation on the Board.

The CHAIRMAN replied that the Commissioners had an open mind with regard to the matter, leaving it to the districts concerned to decide the merits of the case. In Lancashire direct representation had been granted.

The explanation was forthcoming that in Derbyshire there is an association of Rural and Urban Councils in connection with which periodical conferences are held, it being suggested, therefore, that through this arrangement better oversight might be given to any matters at issue.

At the conclusion of the inquiry, the Commissioners paid a visit to the new North Wilford power station, where substantial progress is now being made with the works.

THE TRADE OF AUSTRALIA.

[IMPORTS AND EXPORTS.]

THE following figures, showing the values of the imports of electrical and allied goods into Australia in 1921-22 are taken from the recently-published official trade returns. For purposes of comparison the figures for 1920-21 are given, and notes of increases or decreases are made.

	1920-21 £	1921-22 £	Inc. or dec. £
Gas and oil engines.			
Total	435,000	189,000	−246,000
From United Kingdom ...	237,000	86,000	−151,000
,, Canada	32,000	7,000	− 25,000
,, United States	156,000	91,000	− 65,000
,, Sweden	2,000	2,000	—
High-speed reciprocating steam engines for electric generators or for pumps.			
Total	3,000	10,000	+ 7,000
From United Kingdom ...	3,000	10,000	+ 7,000
Dynamo-electric machines, static transformers, induction coils, electric fans and parts thereof.			
Total	1,682,000	1,349,000	−333,000
From United Kingdom ...	952,000	689,000	−263,000
,, United States	683,000	606,000	− 77,000
Regulating, starting and controlling apparatus.			
Total	215,000	349,000	+134,000
From United Kingdom ...	138,000	227,000	+ 89,000
,, United States	74,000	120,000	+ 46,000
Electrical fittings, viz., switches, fuses and lightning arresters.			
Total	269,000	217,000	− 52,000
From United Kingdom ...	148,000	118,000	− 30,000
,, United States	88,000	93,000	+ 5,000
,, Japan	33,000	5,000	− 28,000
Electric heating and cooking appliances.			
Total	51,000	16,000	− 35,000
From United Kingdom ...	19,000	6,000	− 13,000
,, United States	30,000	9,000	− 21,000
Electrical appliances, other.			
Total	808,000	696,000	−112,000
From United Kingdom ...	383,000	354,000	− 29,000
,, United States	71,000	223,000	+152,000
,, Netherlands	100,000	98,000	− 2,000
Telephone apparatus.			
Total	256,000	386,000	+130,000
From United Kingdom ...	63,000	155,000	+ 92,000
,, United States	162,000	215,000	+ 53,000
,, Sweden	27,000	7,000	− 20,000
Accumulators or storage batteries.			
Total	107,000	91,000	− 16,000
From United Kingdom ...	48,000	58,000	+ 10,000
,, United States	58,000	27,000	− 31,000
Arc lamp carbons.			
Total	10,000	5,000	− 5,000
From United Kingdom ...	7,000	4,000	− 3,000
,, United States	2,500	1,000	− 1,500
Arc lamps, carbon in blocks, vacuum tubes, measuring and recording instruments, insulating tape.			
Total	272,000	374,000	+102,000
From United Kingdom ...	154,000	275,000	+121,000
,, United States	76,000	87,000	+ 11,000
Lamps and lampware.			
Total	378,000	203,000	−175,000
From United Kingdom ...	113,000	57,000	− 56,000
,, Japan	67,000	18,000	− 49,000
,, United States	171,000	98,000	− 73,000
Steam turbines, economisers, superheaters, &c.			
Total	221,000	224,000	+ 3,000
From United Kingdom ...	218,000	223,000	+ 5,000
,, United States	3,000	1,000	− 2,000
Cable and wire, covered.			
Total	1,233,000	888,000	−345,000
From United Kingdom ...	1,181,000	860,000	−321,000
,, Japan	7,500	4,000	− 3,500
,, United States	37,000	22,000	− 15,000

As our readers are aware, Australia has made a beginning in the export of electrical machinery and appliances. The values of such goods, of Australian manufacture, are given below, but they do not appear to indicate progress:—

Machinery and appliances, electrical.			
Total	20,000	10,000	− 10,000
To New Zealand	11,000	4,000	− 7,000
,, Fiji	4,000	400	− 3,600
,, Hong Kong	—	2,000	+ 2,000
,, India	1,500	—	− 1,500
,, South Africa	1,100	—	− 1,100
Electrical materials.			
Total	68,000	18,000	− 50,000
To New Zealand	66,000	16,000	− 50,000
,, Fiji	1,600	500	− 1,100

Export Credits Scheme.—On July 12th, in the House of Commons, Lt.-Col. Buckley stated that the total amount of advances made and bills guaranteed under the scheme was £5,566,521. Of this total, advances had been repaid or guarantees cancelled to the amount of £2,464,947, leaving still outstanding £3,101,574. In addition, credits had been sanctioned and not yet taken up to the amount of £10,244,745. Thus the amount actually in use or earmarked was £13,346,319 out of the £26,000,000 authorised by Parliament, leaving a balance available of £12,653,681.

PARLIAMENTARY NOTES.

[By Our Special Parliamentary Reporter.]

City and South London Railway Bill.—This Bill (proceedings with regard to which have been reported in previous issues) came before a committee of the House of Lords on July 10th.

Sir Lynden Macassey, K.C. (who, with Mr. E. Shortt, K.C. and Mr. Szlumper, appeared for the company) explained that the Bill, in conjunction with one promoted by the London Electric Railway Co., would permit trains to be run from Edgware, in the north of London, to Sutton in the south. The Bill had the support of all the local authorities in the districts to be served, but it was opposed by the Southern Railway Co., which said that its interests would be effected by the diversion of a part of its traffic to the new line. Sir Lynden Macassey said that this was not the case as increased facilities created new traffic. Lord Ashfield gave evidence in support of the scheme, and said that if the Bill was passed at once it would be possible to construct a part of the line upon the surface which would lower the cost considerably. They estimated that an annual surplus of £13,925 could be earned by the line. Mr. Macmillan, K.C., for the Southern Railway Co., disputed the soundness of the statistics upon which this estimate was made, suggesting that the population within a mile radius of Clapham Common Station had been considered twice over.

On July 11th, Mr. Frank Pick gave evidence for the promoters, and corroborated the figures put forward by Lord Ashfield. He said that within a 10-mile radius the interests of the public could be best served by underground railways. Mr. Macmillan asked for the Committee to be reassured as to the willingness of the Trade Facilities Committee to guarantee the repayment and interest of the money required, and Lord Ashfield gave evidence in proof of this.

In reply to Lord Raglan, Lord Ashfield said that a loss of £200,000 could be met from the Common Fund of the "Underground" group. Sir H. A. Walker (general manager of the South-Western Section of the Southern Railway) said that his company was contemplating the expenditure of £7,000,000 upon electrification. He estimated that the proposed new line would not carry more than 16,000,000 (as against the promoters' 22,800,000) passengers per annum, and that the average fare would be 3d. not 4d. There would, therefore be a loss of £166,000, instead of the anticipated profit. If the Wimbledon and Sutton line had been constructed as originally intended, by this time it would have been absorbed by the Southern Railway Co., which thereby could serve the needs of the area. Sir William Forbes (late general manager of the L.B. & S.C. Railway) also gave evidence against the Bill.

On July 12th, Counsel for both parties addressed the Committee, Mr. Macmillan pointing out that the keynote of the Railway Act of 1921 was the elimination of unprofitable competition. He alleged that the "Underground" companies finding it difficult to carry on as underground tramways wished to come to the surface to compete with the railways.

Sir Lynden Macassey urged that the companies were following the recommendations of the London Traffic Commission. If, as had been suggested, the line were stopped short at Tooting Common it would mean that it could neither be constructed nor operated, for financial reasons. The Chairman (Lord Beauchamp) said that the Committee would not allow the Bill to proceed, so far as the whole extension of the railway from Clapham Common was concerned, but, if there were any other technical matters left to be dealt with, the Committee would hear them.

Mr. Shortt (for the promoters) said that in view of that decision, the London Electric Railway Bill would probably be withdrawn. He asked for an adjournment until July 17th, to enable the promoters to consider their position. This course was assented to, and the Committee adiourned.

On July 17th, the Committee resumed its sitting, and Mr. T. Seagar Berry (Messrs. Sherwood & Co., Parliamentary Agents) said that discussions were taking place between the promoters and the Southern Railway Co., and he asked that there should be a further adjournment, in order that these discussions might continue. The chairman said that the Committee was very anxious to meet the wishes of the parties, and accordingly, the proceedings were adjourned until a date to be fixed later.

High-Power Wireless.—On July 10th, Sir L. WORTHINGTON-EVANS informed Mr. Becker that, apart from the Marconi Co., only one private company had recently applied for a licence to erect a high-power radio station in this country. This application was under consideration. No such licence had ever been issued for commercial purposes to any private company other than the Marconi Co., although licences in respect of high-power stations for experimental purposes had been issued some years ago to three other companies.

Answering Mr. Hurd, Mr. ORMESBY-GORE, Under Secretary for the Colonies, said there was no high-power station at present in operation in the West Indies. There were objections to a system of high-power radio telegraphy as the sole method of communication with the West Indies, and the Government took the view that the needs of the West Indies could best be met by supplementing and improving the present system of cable communication. There were certain low-power radio stations in the West Indies which were used for local communication, and it was possible that under the new scheme additional stations of this kind might be erected as auxiliaries to the cable system.

Fuel Consumption in Power Stations.—On July 10th, Colonel ASHLEY, replying to questions by Mr. Hardie, said that the average consumption of coal per kWh generated at the Dalmarnock power station during the past year was 1.99 lb. The lowest average consumption at any steam power station in Great Britain during the year was 1.73 lb. per kWh generated. The Commissioners had no particulars concerning generating stations in Ireland, which were no longer under their jurisdiction.

Electric Contact Mines.—On July 11th, Mr. EYRES MONSELL, Financial Secretary to the Admiralty, informed Sir Frederick Sykes that electric contact mines had been used by the Admiralty years before the war. Their re-introduction during the war for use with nets was due to the late Admiral of the Fleet, Sir A. K. Wilson, who designed special devices in connection with them. Orders for manufacture in quantities were given in April, 1915.

Relief of Unemployment.—On July 11th, the PRIME MINISTER, answering Dr. Macnamara, said that the arrangements made by the late Government for the grant of financial assistance to works for the relief of unemployment had been continued and expanded by the present Government. A circular had been sent in May last by the Unemployment Grants Committee to local authorities, inviting them to submit proposals for schemes for next winter. A further circular on the subject had now been issued. Electrification schemes were in progress on the suburban lines of the Southern Railway; extensions and improvements were being carried out on the London Electric and City and South London lines; further powers for considerable extensions of the Underground companies' lines were being sought by Bills of the present session; and other railway companies were understood to be considering the question of electrification, especially in relation to the suburban areas served by them.

British Empire Exhibition.—On July 11th, Lord WOLMER, Parliamentary Secretary to the Board of Trade, stated, in reply to Mr. Becker, that he understood that in the case of manufactured articles to be shown at the British Empire Exhibition, the Exhibition authorities required that at least 51 per cent. of the value of any such articles should be due to British material and/or British labour. If this proportion were increased to 100 per cent., the effect would be to exclude all articles containing any foreign-produced raw material, such as cotton or any semi-manufactured product of foreign origin. The Dominions for tariff purposes treated as British any articles into whose value British labour or materials entered to the extent of 25 per cent.

The Rutenberg Concession.—On July 16th, in reply to questions put by Mr. Becker, Mr. ORMESBY-GORE said that he was not aware that the Jaffa municipality had opposed the erection of electric standards in Jaffa by the Rutenberg Co. Nor was he aware that their erection, which had the full consent of the Palestine Government, had been the cause of unrest.

Lead Poisoning.—On July 12th, a debate took place on the Home Office Vote in the House of Commons. Lord H. CAVENDISH-BENTINCK raised the question of lead-poisoning, and said that of late there had been an alarming increase in connection with lead-poisoning cases in the manufacture of electric accumulators. There were 35 cases in 1921, 31 in 1922, and from January to May of this year there were no fewer than 24.

Mr. G. LOCKER-LAMPSON, Under Secretary to the Home Office, in reply, said the Government was deeply concerned in the safety of the workers, and would leave no stone unturned to get to the root of the matter and to do what was best for all concerned.

Other matters raised during the debate dealt with factory inspection, better lighting in factories, and workmen's compensation, to all of which the Minister gave a favourable and sympathetic reply.

LEGAL.

The London Electricity Scheme.

As briefly noted in our last issue, the case of the King *v.* Electricity Commissioners, *ex parte* London Electricity Joint Committee and others, came before the Court of Appeal, consisting of Lord Justices Bankes, Atkin and Younger, on July 9th, upon the appeal of the companies from the judgment of a Divisional Court composed of the Lord Chief Justice and Justices Avory and Roche, discharging rules *nisi* of *certiorari* and prohibition which had been obtained against the Electricity Commissioners. The grounds on which the rules were granted were that the provision of the London Electricity Scheme by which it would be made compulsory upon

the Joint Electricity Authority at its first meeting to appoint and keep appointed two Committees of the Joint Electricity Authority, and the provision of the said scheme, by which it would be rendered compulsory upon the Joint Electricity Authority to delegate to the two Committees the powers and duties of the authority mentioned in the third annex to the said scheme, were *ultra vires* the Electricity Commissioners and contrary to the provisions of the Electricity (Supply) Acts, 1919 and 1922.

The previous proceedings were reported in the ELECTRICAL REVIEW of March 23rd and April 20th, 1923.

Mr. Talbot, K.C., Mr. Tyldesley Jones, K.C., and Mr. W. S. Kennedy appeared in support of the appeal, and the Attorney-General, Sir Douglas Hogg, K.C., Mr. MacMorran K.C., and Mr. Bowstead represented the respondents (the Crown).

Mr. TALBOT, in opening the appeal, said that he and those associated with him, represented all the companies supplying London. The point he took was that the scheme was not London. The point he took was that the scheme was not a scheme which the Commissioners were authorised to prepare or submit.

At the close of the appellants' case, the hearing was adjourned, and on July 11th the Attorney-General, supporting the judgment of the Divisional Court, submitted (1) that *certiorari* and prohibition would not lie at all, and (2) on the merits that the Electricity Commissioners had ample authority to do what they had done.

The hearing was continued on July 12th, when the Attorney-General said the Commissioners had not purported to put forward any scheme at all. All that they said in effect was "here is a scheme which we are advised is within our power, and we are now going to consider whether it is advisable." If difficulties were made out, the Commissioners would, no doubt, modify the scheme, or would scrap it if it turned out to be unworkable. The scheme did not purport to compel anybody to transfer his undertaking to the authority. He submitted that the appeal failed, and should be dismissed.

Mr. MACMORRAN followed on the same side.

Mr. TALBOT having replied, their Lordships reserved judgment.

Unstamped Insurance Cards.

At Aldershot, on July 5th, James Alexander Noble Russell, electrical engineer, until recently in business at 8, Birchett Road, Aldershot, was summoned for failing to pay National Health Insurance contributions and unemployment contributions in respect of three employés. It was stated that in two of the cases defendant had deducted weekly contributions from the employés' wages, and the total amount of the arrears was £3 11s. 1½d. Defendant had been given an opportunity to pay the arrears, but had failed to do so. The Bench imposed a fine of £2 10s. in each case.

British Thomson-Houston Patents.

For infringements of their letters patent in connection with incandescent electric lamps, Mr. Justice Russell, in the Chancery Division on Tuesday, granted to the British Thomson-Houston Co., Ltd., injunctions against the Cash Lamp Supply Co., of Southport, Lancs.; I. M. Brandis, of Petherton Road, London, N.; and Lancelot Booth, of Canfield House, Finchley Road, London, N.

There was no opposition in any of the cases.

British Standard Specifications.—Following the issue of British Standard Specifications Nos. 109/1923 and 110/1923 for air-break switches and air-break circuit breakers, the British Engineering Standards Association has prepared 13 additional specifications relating to switch and control gear, as follows:—No. 124/1923, totally-enclosed air-break switches; No. 130/1923, totally-enclosed air-break circuit breakers; No. 126/1923, flameproof air-break switches; No. 127/1923, flameproof air-break circuit breakers; No. 117/1923, drum starters for electric motors; No. 140/1923, liquid starters; No. 141/1923, switch starters; No. 147/1923, multiple switch starters; No. 155/1923, contactor starters; No. 167/1923, auto-transformer starters; No. 118/1923, drum controllers; No. 123/1923, face plate controllers; No. 129/1923, contactor controllers. The specifications for switches and circuit breakers are for voltages not exceeding 660, and follow the same general lines as Nos. 109/1923 and 110/1923, but there are a number of additional clauses special to enclosed switchgear; for example, containing case, interlocking, clearances, &c. In the case of the switch specifications, a test of breaking capacity has been included, and in the flame-proof switch- and circuit-breaker specifications a test of "flame-proofness."

Every endeavour has been made to secure the uniformity of the starter and controller specifications as far as possible. Each specification is sectionalised as follows:—General definitions; definitions of enclosures; rating; sizes and marking; design and construction; tests. Copies of the specifications are obtainable from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. each.

CORRESPONDENCE.

Letters received by us **after 5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

C.T.S. Wiring in Workshops.

I was interested in the letter of your correspondent, Mr. Peronne, in respect of C.T.S. wiring. As is usual with regulations issued by the Board of Trade or Government departments generally, the rules for the guidance of engineers and contractors are delightfully vague.

Rule No. 2, to which I presume Mr. Peronne refers, reads as follows:—

"The consumer's wires forming the connections to motors, or otherwise, in connection with the supply, shall be, as far as practicable, completely enclosed in strong metal casing efficiently connected with earth, or they shall be fixed in such a manner that there shall be no danger of any shock."

The last clause is one which cancels everything else, that is to say, presumably, if an engineer prefers to take the risk of shock, he can put what system of wiring he likes in connection with any pressure from 250 to 650 volts. If the person gets a shock, he is wrong; if the person does not get a shock, I presume no one has anything to say about the matter. I am absolutely in agreement with Mr. Peronne that the best system of wiring at present in use is the C.T.S. system.

I am somewhat surprised that supply authorities are objecting to it in connection with medium-pressure supplies, but I can assure him that it is not the case with all supply authorities. It would, however, be wise for the contractors to use a considerable amount of discretion when installing C.T.S. cable for medium pressures, as, when all is said and done, the cable is comparatively easily damaged or cut. That is at present the difficulty which militates against the use of C.T.S. cable. The L.C.C., for instance, in licensed buildings, insist upon adequate protection for the cable within reach of the public. The point is, what sort of protection is considered adequate. It has been suggested that the cable in such places should be put in steel tubing. This I consider is an absolutely wrong procedure, and should not be permitted on any account. A suitable hard-wood casing is the best method that I know of at present, to prevent the malicious cutting or damage of the cable.

I feel sure that supply engineers, with wide general experience of breakdowns on consumers' installations, would raise no objection to the use of C.T.S. cable for pressures up to, say, 500 volts, provided adequate protection was guaranteed within reach of the operators of the motors or the workmen in the factories. Without this protection the system is dangerous. It undoubtedly makes a much better job, generally speaking, than any tubing system. The Editors' remarks amuse me, as they are again flogging a dead horse regarding wiring rules issued by supply authorities. Supply authorities are well aware that they have no legal authority to issue and enforce such regulations. They are also well aware that they cannot carry on an efficient supply system without enforcing such regulations in the interests of consumers, the better-class contractor, and the efficiency and reliability of the supply. The Government regulations can only be used as a guide. In almost every case a definite recommendation is carefully cancelled by some such clause as that referred to above, namely "that they shall be fixed in such a manner that there shall be no danger of any shock," the object presumably being to shift the responsibility from the shoulders of the Government on to the poor supply engineer, or consulting engineer responsible for the job.

W. E. Bradshaw.

London, *July 16th*, 1923.

[The "horse" has a good deal of life left in it yet; supply authorities, of course, know that they are bluffing, but consumers, and even some contractors, don't know that. Some supply authorities insist on the use of steel conduit everywhere; some insist on the use of pure rubber insulation and not vulcanised rubber for flexibles; and so on—but such requirements, besides being technically unjustified, are entirely *ultra vires*.—EDS. ELEC. REV.]

With reference to the correspondence going on in the REVIEW under the heading of "C.T.S. Wiring," which I have read with interest, the letter over the signature of Mr. J. H. Sergeant cannot be substantiated by actual facts. In the first place, I would say that the whole question of the conduit system where used in damp situations was fought out at considerable length in the electrical Press some years ago, and I think the experience gained during the war in the Government acid factories, and other chemical works, proved conclusively that conduit and similar systems, while being ideal under certain conditions, did not make a satisfactory job when used under conditions where damp and chemical fumes had to be contended with.

Mr. Sergeant makes a point of saying that if adequate provision is made for draining off any moisture which may collect

due to condensation, all will be well, but here he contradicts himself.

My experience proves that this theory is entirely wrong. What I find actually occurs is that the only moisture which escapes at the drain holes is extra to what the tapes and braids will absorb, with the result that the covering of the cable is continuously in a state of varied dampness, and coverings in this condition will perish far more rapidly than if totally submerged in water.

I agree that stepping conduit off the wall will tend to reduce the trouble of condensation if the installation is confined to one room only, and that one which is kept at a fairly even temperature, but how often do you get these ideal conditions?

What you usually get is a different temperature in every room, either due to the requirements of manufacturing processes, or to the individuals who work therein, and variation in temperature between midday and midnight.

Personally, after years of experience in wiring in probably the worst situations possible, I have come to the conclusion that the open wiring system is the only one that can be safely recommended, but a word of warning should be put in here—namely, that the question of sealing the ends of the cables and terminals must be given very serious consideration.

Another point on which I cannot agree with Mr. Sergeant is that he insists on the use of a 2,500-meg. grade cable. Personally, after considerable experience, both in the use and manufacture of cable, I have yet to find the individual who can tell me with assurance the difference between the 600-meg. and the 2,500-meg. grade cable, and it is rather a coincidence that only this week one of the leading members of the C.M.A., in its full-page advertisement, makes the following statement, which I think more than confirms my remarks:—

"You cannot judge the quality of cables and wires by their appearance. The ordinary dielectric tests do not constitute a completely satisfactory basis of judgment because these tests do not always reveal certain faults in the materials or manufacture, which may, at some distant date, have the most unfortunate results."

J. C. White, A.M.I.E.E.

Manchester, *July 16th*, 1923.

The Safety of Electricity.

Your contemporary the *Gas Journal* in the electrical notes of its last issue states that "wiseacres hundreds of miles from the scene of the mishaps," have not had much to say about a fire at the Scottish Co-operative Wholesale Society at Glasgow, suggesting by inference, I take it, that the fire was of electrical origin.

May I say at once that if the Editor of the *Gas Journal* will refer to the Fire Department or the Salvage Department of the City of Glasgow, he may be surprised to learn the actual cause of the fire in question, also that it was not due to the fusing of an electric wire as was "supposed" by the local Press, neither was it an electrical fire in any sense of the word.

It seems a pity that such a reputable journal should not take the trouble to investigate more closely matters of this kind. The *Gas Journal* and the daily Press and, what is more important, the general public know very well that electric light is the safest artificial illuminant in the world, and indeed less uncomfortable than some of the natural daylight of the last few days.

Electrical enthusiasts should lose no opportunity to correct their local papers whenever these erroneous reports are circulated.

V. W. Dale.

London, *July 13th*, 1923.

"Starting Torque and Current of Squirrel-Cage Induction Motors."

May I correct three clerical errors which I notice in my article in this week's issue of the ELECTRICAL REVIEW?

In column 1, page 45:

Instead of "g ohms," read "g reciprocal ohms";
Instead of "b ohms," read "b reciprocal ohms";
Instead of "$K=1+YZ$," read "$K=1+YZ$,"

T. F. Wall.

Sheffield, *July 14th*, 1923.

Patents and Inventions.

Referring to your correspondent's suggestion in your last issue, I appreciate his point of view, but fail to see that a Government department would be the best judge of merit. Is such judgment to be based on technical, national, or commercial considerations? Is an advertising novelty as likely to gain commendation as, say, a drift indicator? If not, the department would be of little use to those who seek early remuneration before embarking on ambitious but hazardous schemes.

Personally, I have more confidence in the existing Institute of Patentees, Incorporated, than in a Ministry of Inventions. The reports issued by the Institute's experts are impartial and must be valued by all true inventors who endeavour to build according to sound scientific principles.

In addition to this and other services, the protection that organisation implies is most valuable during negotiations for the sale of patents, and makes even Associate Membership well worth while.

As suggested in my previous letter, there are to my mind, several avenues waiting to be explored, but the first essential for every patentee is efficient organisation such as the Institute offers.

M. I. P.

July 16th, 1923.

I have read with interest the correspondence under the heading of "Patents and Inventions," but there is one side of the question which the various writers have not touched upon, namely, the relation between the employer and employé. My own experience would probably be a warning to inventors who are employés.

I was engaged as a salesman for one of the leading electrical manufacturing concerns, and outside my ordinary duties I invented certain fittings. In a weak moment, and on the strength of promises which did not mature, I allowed my employers to become joint patentees. After they had secured this advantage they then came along with an agreement asking me to assign the whole of the patents for the nominal sum of a sovereign (£1), further remuneration to be left to the discretion of the directors.

If this practice is common I would strongly advise inventors under similar conditions not to take out patents in their own names, as they would, I feel sure, be in a much better position to negotiate terms if the patents were in the name of an independent person.

I trust my experience will be a warning to other individuals placed in a similar manner.

Voltaic.

July 16th, 1923.

[Our correspondent was badly treated—unless the "further remuneration" that he received was adequate. But a patentee has to declare that he is the first and true inventor (though he may associate himself with others in making the application), and a patent taken out by a person who is not the inventor is invalid.

Employers cannot claim to be joined in the patent application, nor have they any right whatever to a share in a patent, even though the invention be made whilst the inventor is working for them, unless he is specifically commissioned by them to devise the invention for them.—EDS. ELEC. REV.]

The N.E.C.T.A. Trading Policy.

Knowing the enormous amount of work and time put into the formulation and laying down of this policy by so many of our past-presidents and Mr. Riggs, I am impatient to see results. I have been expecting other sections of the industry to publish their views on trading, but up to now see no sign. The C.M.A., A.M.A., and E.L.M.A. policies although they never have been published, we know something of.

We get so far, and blame each other, but do not advance. All our aims are good, and if we could all look at things from each other's point of view as well as our own, we might advance faster.

On our side, let us, as electrical contractors or retailers, recognise our own shortcomings and remedy them.

With regard to showing and demonstrating electrical apparatus for domestic use by means of shops and showrooms, contractors are making rapid strides, and it is the aim of the N.E.C.T.A. to be in a position to say that wherever there is a public supply of electricity, there is a member of the N.E.C.T.A. with a properly equipped shop and showroom to demonstrate and sell all electrical apparatus required for domestic work on that supply.

Turning now to the quantity discount, I am a firm believer in two discounts: One a trade discount, absolutely for the trade only, and another discount allowed to anyone for quantities. But this point is very important—the quantity discounts should be for one lot delivered to one place. The trade discount should not be too large. Roughly speaking, the total of the trade and quantity discounts for moderate quantities should be about the present standard 33⅓. Then wholesalers buying in larger quantities would have a reasonable margin for profit on resale to retailers, and large contractors would benefit as well from larger buyings. I feel sure manufacturers would welcome such methods, as it must be very costly to them to have to allow large trade discounts on single small articles. This method as outlined would certainly help the legitimate contractor against the "here to-day and gone to-morrow" type. With a smaller trade discount it could be more easily enforced; the larger works and multiple shops buying from central stores would receive a reasonable and fair advantage through buying in quantities.

The N.E.C.T.A. is not going to let this trading question lie dormant, and will agitate and agitate until trading methods in the electrical industry are as good as, if not better than, those of any other industry in the country.

Newcastle-upon-Tyne, *July 12th*, 1923.

R. E. Robson,
President, Electrical Contractors' Association, Inc.

NOTES FROM CANADA.

(From Our Special Correspondent.)

THERE is at present in this country a good deal of hydro-electric development going on—one firm alone is said to be working on contracts for the following large turbines:—Three of 58,000 h.p. each, for the Hydro-Electric Power Commission of Ontario; four of 30,000 h.p. each, for the Shawinigan Engineering Co., Quebec; four of 11,300 h.p., for the Montreal Light, Heat & Power Co.; one of 11,000 h.p., for Price Bros., Chicoutimi, Quebec. The Southern Canada Power Co. is preparing to develop Hemming Falls on the St. Francis river to the extent of 30,000 h.p., as there is said to be an immediate demand for 20,000 h.p.

In British Columbia the B.C. Electric Railway has plans for development, which will increase its turbine capacity by over 100,000 h.p.

In the same province the West Kootenay Power Co. intends to increase its present 30,000 h.p. development at Bannington Falls, on the Kootenay River, to 60,000 h.p.

The Kakakeka Falls, on the Quinze River, Quebec, have recently been leased to private interests by the Government of the Province, and a start has already been made on development work there, the horse-power available being about 90,000. The power will mostly be used by the mining industries of Northern Ontario, which have been greatly hampered for lack of power during recent months.

The Ottawa & Hull Power Co. intends to develop about 50,000 h.p. at Calumet Island Falls, on the Ottawa River, for which a dam 300 feet long and 85 feet high is required. The Falls are said to be capable of a complete development of 250,000 h.p.

The Quebec Development Co. has ordered no less than eight 30,000-kVA generators from the Canadian Westinghouse Co., and the St. Maurice Power Co., of Montreal, has contracted with the same firm for four 33,000-kVA generators, and twelve 11,000-kVA transformers, together with switchgear.

The Prime Minister of Quebec not long ago stated that the Province would build a dam at the Grand Discharge from Lake St. John, from which an ultimate development of nearly one and a quarter million horse-power could be made.

According to a report published a few weeks ago by the Water Power Branch of the Department of the Interior, at Ottawa, the hydro-electric installations under construction or actively projected throughout the Dominion represent a total development of 971,000 h.p., and it is added that in a number of existing plants provision has been made for extensive additions as the loads increase, while numerous projects additional to those included in the above total are being studied.

The power situation in Ontario is such that Sir Adam Beck, chairman of the Hydro-Electric Power Commission of that Province, announced at the beginning of this year that there would be a serious shortage of power by 1926, and that unless the St. Lawrence River development were put in hand the Commission would have to build steam plant.

REVIEWS.

The Mechanisms of Machine Tools. By THOMAS R. SHAW, M.I.Mech.E. Pp. xii+351; figs. 433. London: Henry Frowde and Hodder & Stoughton. Price 42s. net.

Considering the importance of the machine tool in all engineering work it is rather remarkable that so little attention has been paid to the subject of its design and construction, and further that so little research work is carried out with a view to producing improved or even new designs. It may be that the reason for this is to be sought in the fact that machine tool manufacture has become a highly specialised business, and that the majority of engineering firms are content to make use of such tools as are placed upon the market. While this is undoubtedly the case, it is a very mistaken attitude to adopt, since it removes the initiative for the design of a machine tool from the user—the man who knows exactly what is required—to the manufacturer who can hardly be expected to know the exact requirements of his clients. How true this is, is demonstrated by the fact that quite recently two instances have come to our notice in which well-known engineering firms have been compelled to design and construct their own machine tools—and not highly specialised tools either—because the manufacturers were not prepared to meet their requirements. Of course, we do not submit that the electrical manufacturer would be well advised to construct his own lathes, but it is certain that he has a fuller knowledge of the exact requirements of that particular machine in his own business than has the lathe maker himself. Witness the fact that many engineers construct all manner of "gadgets" for use on their lathes to facilitate the work of these machines.

We are led to these thoughts from a study of Mr. Shaw's book on "The Mechanisms of Machine Tools," quite the worst part of which is the title, since it fails to indicate the scope of the subject dealt with. In it he has described with a great wealth of detail the design and construction of the more usual forms of machine tools, such as the lathe, the milling machine, &c., found in the engineering workshop. But in addition to this he has also given us what will be of far greater use to the manufacturer of electrical machinery, some valuable information on such subjects as the setting and adjustment of machine tools, the transmission of power to machine tools, the materials of construction, and kindred subjects, all of which will assist the machine tool user to obtain better results from such tools as he has available in his shops. After all, it is the exception for the manufacturing engineer to design and construct his own machine tools; he is content to go to the recognised specialists for these, but a study of this work will enable him to realise the vast improvements that have been made in machine tool design, and also the capabilities of the various types that are available. As a link, therefore, between the maker and the user of machine tools this book should prove of considerable value. We were inclined at first to believe that it was essentially a book for the machine tool designer, but we realised on a more complete study of its contents that it will prove of considerable value to the works manager and the foreman, not only for the valuable information which it contains on the operation of machine tools, but because it will enable them to understand more completely the capabilities of the machines in their charge. No attempt has been made to deal with the less common machine tools, only those in general use being considered, but so complete is the description of these, that any engineer should find the book of exceptional value if he is contemplating the design of a machine tool for any particular purpose. A word of praise must be given to the large number of working drawings, both of the complete machines and of the detailed part, which are of a very high standard of excellence throughout the book.

This is essentially a book which should be in the library of every electrical engineering manufacturer.

Telephony: An Elementary Exposition of the Telephone System of the British Post Office. By T. E. HERBERT, M.I.E.E. Pp. xv+126; figs. 33. London: Sir Isaac Pitman & Sons, Ltd. Price 18s. net.

This volume on telephony, by the well-known author of "Telegraphy," is essentially a hand book for the student who is preparing for the examinations of the City & Guilds of London; but, although in its general treatment of the subject, it covers the syllabus of Grade I, much of the matter required for the Final Grade has been included. An introductory chapter is devoted to the fundamental principles of electricity and magnetism in order to equip the student with the knowledge required for the subsequent chapters.

The first chapter deals with primary cells, and gives a concise epitome of the work done in the Post Office to bring the Leclanché cell to its present high efficiency by discarding the granular manganese peroxide in favour of the powdered form—a form which the earlier text books condemned as being the main condition to be avoided in the setting up of a Leclanché cell.

Chapter 2 deals with the various ways of arranging cells, and with methods of calculating the resistances of wires, as also the currents produced when these are connected to batteries.

Chapter 3 deals with the magnetisation of iron, and the usual formulæ are given for calculating the flux in a magnetic circuit.

Chapter 4 is devoted to the construction of resistance coils and galvanometers with their shunts. It is observed in this latter connection that although the tangent galvanometer has disappeared from the Post Office service, still continues to be included in the syllabus of the City and Guilds, which only hold these examinations for Post Office employés.

Chapters 5 and 6 are devoted to the measurement of battery resistance, and to the measurement of line resistances by the Wheatstone bridge and Megger. No indication is given in the chapter on the bridge Megger as to the method of joining up when a single line only is under test.

Chapter 7 gives a brief account of condensers, and the method of calculating their capacities in absolute and practical units, and in Chapter 8 alternating currents are dealt with in an elementary manner. It is unfortunate that the author should, on page 206, correctly define p as $2\pi\times$ periodicity, and subsequently say on page 209 "For a given frequency . . . ." To the beginner this is likely to cause confusion.

Chapter 9 gives a popular outline of the principles underlying the production of sounds and the transmission of speech. Modern telephone receivers are clearly described and well illustrated, and Chapter 10 deals with the various types of transmitters, &c.

In Chapter 11 bells, generators, sets, connectors, switches, &c., are dealt with.

Chapter 12 shows the principles of intercommunication by house telephones and private wires. Jacks, keys, and auxiliary apparatus generally are illustrated in Chapter 13, and the various types of magneto switchboards in Chapter 14.

Chapters 15 and 16 deal in a clear and comprehensible manner with common battery signalling, and common battery

systems, and Chapters 17 and 18 with private branch exchanges and junction circuits, followed in Chapter 19 by a description of trunk working.

Secondary cells, and power plant in relation to exchange working, are very clearly treated in Chapter 20, and in Chapter 21 the methods employed for protection from lightning and power circuits are fully set out, along with the methods of internal wiring and cabling of exchanges, and subscribers' premises.

In localising an earth it would be preferable, and generally more expeditious, to commence operations nearer the centre of the line instead of at the terminal station, as illustrated on page 581.

Routine and fault testing are fully dealt with, and the requisite apparatus clearly illustrated.

Chapter 23 introduces the student to the principles of speech transmission, loading, and measurements in terms of the standard cable, followed by descriptions of methods for cable balancing, superposition, miscellaneous circuits, &c.

Chapters 24 and 25 deal with constructional details, both overhead and underground, and the book concludes with a description of the thermionic triode valve and its application to telephone repeaters.

On the whole, the author has furnished students with a book which will give them a good grounding in the subject of telephony, and has exercised much discrimination in the selection and presentation of the matter required to meet the examination syllabus. The printing and illustrations are excellent. On page 204, second line from the bottom, the Greek letter ϕ has dropped out. On page 409 the Greek letter nu (ν) might be more appropriately replaced by an ordinary script v.

BUSINESS NOTES.

Bankruptcy Proceedings.—Robert Wright, electrical engineer, trading at 34-36, Oxford Street, W., as "Robert Wright and Co."—Under this receiving order the first meeting of creditors was held last week at the London Bankruptcy Court. Mr. Armstrong, Official Receiver, reported that in his preliminary examination the debtor had stated that upon being demobilised from the Army at the end of 1918 he was engaged by firms in the electrical trade. Two years later he started on his own account, mostly doing agency work, taking offices at 25, Great Titchfield Street, and having a free capital of £50. Twelve months afterwards, the business being fairly prosperous, he took additional premises at 34-36, Oxford Street, and in August last, with a view to making wireless apparatus, he opened works at Cricklewood Lane. In September he opened a wireless department at 34-36, Oxford Street, and took as an apprentice one W. O. Taplin, receiving with him a premium of £500. A little later Mr. Taplin (Senior) invested at interest another £500 in the wireless department and was given an appointment at £3 a week salary. In February, 1923, the debtor appointed a Mr. T. W. W. Kirby as works manager on condition that he invested in the business £300, at interest, and he was to receive £4 10s. weekly and a bonus on the profits. At the end of that month an arrangement was made for the debtor and Mr. Kirby to take over premises at 72, Merton Road, Wimbledon, and for the debtor to put in stock £300 against Mr. Kirby's £300 cash. Those premises were opened as "The Reputation Radio and Electric Co.," but the trading name was not registered pending the completion of the partnership deed. That business did not prove a success. A fortnight before the failure the landlord of the Oxford Street premises levied a distraint for £50 arrears of rent, and about the same time execution was put in at the works in Cricklewood Lane by Mr. Taplin in respect of his investment. The works were then closed for want of working capital and because the debtor could see no prospect of an early settlement between the Government and the B. B. Co. on the licensing question. Mr. Taplin had also put in an execution at Wimbledon. No statement of affairs had been lodged, but the debtor roughly estimated his liabilities at £3,864, and valued his assets at £1,250. The latter consisted of book debts, the debtor's share in the Merton Road business and a £5 share in the B. B. Co. The debtor attributed his failure and insolvency to losses on contracts, insufficient staff, slack trade, and to delay in settling the wireless licensing question. The chairman stated that in his preliminary examination the debtor had valued his assets at £250, and consequently an order for summary administration of the estate had been made by the Court. A creditor remarked that the debtor's interest in the Wimbledon business was "all in the air," and it would probably be found that instead of his interest being an asset it would be the "other way round." Mr. R. W Fincham, C.A., was elected trustee to wind up the estate in bankruptcy, assisted by the following committee of inspection: Mr. T. W. W. Kirby, Mr. M. W. H. White, and Mr. T. W. Mills. The fidelity bond to be given by Mr. Fincham was recommended at £300.

T. S. Cartwright, electrical contractor, 90, Wellington Street, Stockport.—Last day for receiving proofs for dividend, July 28th. Trustee: Mr. J. G. Gibson, Official Receiver, Byrom Street, Manchester.

W. H. Vevers, builder and decorator, sanitary and electrical engineer, 91, King Street, Maidenhead.—First meeting July 20th, at 29, Russell Square, W.C.1.—Public examination August 3rd, at the Town Hall, Windsor.

W. E. Weeks, wholesale electrical dealer, 59, Victoria Street, Bristol.—Last day for receiving proofs for dividend July 28th. Trustee, Mr. J. P. Emett, 18, St. Nicholas Street, Bristol.

John Michael, electrical engineer, 6, Sneyd Terrace, Silverdale, and 20, George Street, Newcastle-under-Lyme.—Receiving order made July 12th on debtor's own petition.

J. B. Robertson, electrical engineer's manager, Whitbarrow Lane, Lymm, Cheshire.—Last day for receipt of proofs for dividend August 1st. Trustee, Mr. E. D. Symond, 11, Dale Street, Liverpool.

Company Liquidations.—Electrical Engineering and Equipment Co., Ltd., manufacturing electrical engineers, 109, New Oxford Street, London, W.—In pursuance of the provisions of the Companies (Consolidation) Act, a meeting of the creditors of the above was held on July 12th, at Winchester House, Old Broad Street, E.C. It was stated that the shareholders of the company had previously passed the usual resolution in favour of voluntary liquidation and had appointed Mr. R. Kettle, C.A., 5, London Wall Buildings, E.C., to act as liquidator. No statement of affairs was circulated, but the liquidator's representative, who occupied the chair, reported that the unsecured liabilities totalled something like £20,000, while there were free assets of £3,950. The latter were subject to preferential claims of £770, and there would be net assets of approximately £3,000, or a deficiency of about £17,000. The total liabilities of the company were £24,500, the principal being bankers and cash creditors £13,130, income tax claims and wages unpaid £770, and trade and general creditors £10,600. With regard to the assets the cash in the bank exceeded £3,000, but with the exception of about £50 the bankers claimed the whole of the money as a set-off against the amount due to them. The directors had valued the stock at £1,110, but here again the major portion was claimed by the bank as against advances made. The book debts totalled £1,670, but about 25 per cent. were thought to be irrecoverable. The lease of the premises in Oxford Street had been valued at £1,200, but it might be difficult to realise that figure at the moment, and in addition it was mortgaged. The mortgagee was in possession. There was also some office furniture which might realise a small amount. It would be seen, the chairman added, that the assets were of problematical value, and he was afraid that they would realise less than the £3,000 which was the figure placed upon them by the company's officials. The prospect for the ordinary creditors was somewhat doubtful. In answer to a question, it was stated that there was very little information available as to the trading of the company, which was formed some ten or eleven years ago, and had traded with varying success. The company had made profits and had also sustained losses. During the last two or three years continuous losses had been experienced, probably owing to the state of the electrical industry. There were two directors of the company. He agreed that the company's career had been somewhat chequered, and the last two or three years had been uniformly bad. A creditor remarked that his firm supplied goods on June 12th last, and the company must then have been in a bad way. The Chairman: Yes, the company has been making losses for two or three years. A resolution was passed confirming the liquidation of the company with Mr. Kettle as liquidator.

Submersible Motor Ship Cleaner Syndicate, Ltd.—Last day for receipt of proofs for dividend July 28th. Liquidator: Mr. H. E. Burgess, Senior Official Receiver, 33, Carey Street, W.C.2.

W. G. C. Hayward & Co., Ltd.—Meeting of members on August 14th, at 4, Charterhouse Square, Aldersgate Street, E.C.1, to hear an account of the winding-up from the liquidator, Mr. E. H. Hawkins.

Economic Power, Ltd.—Winding up voluntarily with a view to reconstruction by the sale and transfer of property to a new company called "Automatic Gas Producers, Ltd." Liquidator: Mr. Maurice Williams, Phœnix Works, Altrincham.

Radolion Manufacturing Co., Ltd.—Winding up voluntarily.

Wireless Agencies, Ltd.—Winding up voluntarily.

Private Arrangement.—Walter Ellerslie Cooke, trading as the Universal Lighting Co., 206, High Street, Hounslow, electrical engineer and wireless dealer.—In response to a circular letter issued by Messrs. Fincham, Partridge & Co., C.A., 3,

Warwick Court, W.C., a meeting of the creditors of the above was held on July 10th, when a statement of affairs presented showed liabilities £1,766, made up as follows:—Unsecured trade creditors, £1,226; bank overdraft, £340; and creditor for rent, balance of premium of lease, and telephone, £199. The assets consisted of stock-in-trade at cost, £178; and fixtures and fittings valued at £10, making a total of £188, from which had to be deducted £26 for preferential claims, leaving net assets £161, or a deficiency of £1,604. It was reported that the debtor started business at Reading in September, 1921. He sold the business there for £600 on June 30th, 1922. For a period of seven months the debtor was carrying on business at Reading and at the above address. The trading of the Reading business showed a profit of £314, while the Hounslow business showed a loss of £2,407. It was stated that a deed of assignment had already been executed to Mr. Partridge as trustee for the benefit of the creditors. Asked when the debtor started business at Hounslow, Mr. Partridge said that it was in December, 1921. Debtor had no offer to make, and eventually it was decided to confirm the deed of assignment already executed to Mr. James Partridge as trustee. The following are creditors:—

	£		£
Innovation Light Co. ...	... 14	Cooke & Segal, Ltd. ...	... 458
Smith, J. & W. B., Ltd.	... 161	Wireless Agencies ...	... 11
Claremont, Johnson & Co.	... 24	Worth, H. J.	... 30
The Ever-Ready Co. ...	... 19	Pressey (landlord)	... 36
Bloom, J.	... 15	District Council	... 31
Stores, Ltd.	... 14	Cooke, Senr.	... 190

Dissolution of Partnership.—THE RADIOWAVE CO.—Messrs. E. Davis and H. Norden, and Phyllis H. Savitt have dissolved partnership. All debts due and owing to or by the firm will be received or paid by Phyllis H. Savitt.

Trade Announcements.—With the title EDINBURGH INSTALLATIONS, LTD., a new company is being formed to take over the business of the Edinburgh Armature Repairing Co., 172, Easter Road, Edinburgh. The scope of the business will be extended to include installation work as well as repairs. Catalogues, &c., are desired.

THE BRITISH THOMSON-HOUSTON CO., LTD., which already has large works in Ford Street, Coventry, devoted to the manufacture of ignition magnetos and electric lighting sets for motor-cars and cycles, has now acquired the premises in Alma Street and Hood Street, Coventry, formerly occupied by the Dunlop Rubber Co., Ltd.

THE VINCENT SWITCHGEAR MANUFACTURING CO., of Birmingham, has opened a branch at 1, Union Street, Belfast, where its manager, Mr. Garmany, who will attend to its Irish electrical trade, will hold stocks of all Vincent products.

LE TRANSFORMATEUR SOCIETE ANONYME has removed its offices to Abbey House, 2, Victoria Street, S.W.1.

Catalogues and Lists.—THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—A circular letter and pamphlets drawing attention to new shop-window and exterior lighting fittings. The pamphlets are fully illustrated and priced.

MESSRS. OSWALD RECORD & CO., 17, Victoria Street, S.W.1.—A price list of moving-iron and moving-coil voltmeters, ammeters, &c., and an illustrated pamphlet describing a pocket Wheatstone bridge and a combined voltmeter and insulation testing set.

Mr. FREDERICK PRATT, 66, Victoria Street, S.W.1.—Illustrated leaflets describing the "Vanwyck" overload switch; "Isolit" insulators; and "Zed" fuses.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—A well-illustrated and priced catalogue (No. 64) of "Holophane" glassware for electric lighting purposes. The publication contains a great deal of illuminating engineering data.

MESSRS. MARRYAT & PLACE, 28, Hatton Garden, E.C.1.—A mailing card illustrating an "M.P." geared motor direct-driving a slow-speed ruling machine.

RADIO SPECIALITIES, 57A, Denbigh Street, Pimlico, S.W.1. Two illustrated and priced pamphlets dealing respectively with "Filtron" grid leaks and condensers; and the "Static-Rster,"—a static protective device.

MESSRS. AUSTIN WALTERS & SON, Gaythorn Electric Works, Little Peter Street, Manchester.—A well-illustrated booklet containing particulars of electric signs, resistances, stage arc lamps, &c.

X-RAYS, LTD., 11, Torrington Place, Gower Street, W.C.1.—A circular letter dealing with Coolidge tubes and "Spektra" intensifying screens.

THE ART METAL STAMPING CO., 58 & 59, Graham Street, Birmingham.—An illustrated and priced pamphlet, dealing with the "Brookes (patent) Union" headphones for radio-telephony.

HART ACCUMULATOR CO., LTD., Stratford, E.15.—A priced and illustrated pamphlet (No. 110), dealing with the "ACM" accumulator hand lamp.

MESSRS. GRIERSON, LTD., 43, Bloomsbury Square, W.C.1.—A well-produced booklet describing the principles and methods of warming rooms, &c., by panels.

Receiver Appointed.—GWYNNES ENGINEERING CO., LTD.—Mr. John Davie, has been appointed receiver and manager on behalf of the debenture-holders under an order of the Court, dated July 6th, and he is at present carrying on the business.

For Sale.—The Stockton-on-Tees Electricity Department invites tenders for five boilers, two d.c. reciprocating generating sets, and one 500-kW d.c. turbo-generator. On July 23rd and 24th, Messrs. Herring, Son & Daw will offer for sale a quantity of machinery and builders' plant, including electrical accessories, at the premises of Messrs. Tredegars, Ltd. (in voluntary liquidation), Euston Road, N.W.1. The Doncaster Electricity Department invites tenders for two Willans steam engines, direct-coupled to Bruce Peebles d.c. dynamos. (See our advertisement pages to-day.)

Fire.—As the result of a fire which broke out early in the morning of Friday, July 13th, in the premises of the Siemens and English Electric Lamp Co., Ltd., 38/39, Upper Thames Street, E.C., the fourth (top) floor was completely destroyed. There will be no interference with the execution of orders, as the loss does not in any way affect the dispatch department.

Export Orders Received.—The following contracts have just been booked (or are at the moment in hand) by Messrs. Johnson & Phillips, Ltd., at their Charlton works:—

India.—Transformers for Great Indian Peninsula Railway (electrification of Bombay suburban lines).

18 sets truck type, e.h.p., sub-station switchgear, and l.p. panels for Calcutta Electric Supply.

Australia.—2,200 miles of rubber insulated wire for Postmaster-General's Department.

220 miles signal cable, for N.S.W. Railways.

22 transformers (50 to 1,000 kVA), Victorian State Electricity Commission.

New Zealand.—30 miles aerial cable, for Auckland.

18 miles .075 and .2 sq. in. aerial and rubber cable, for Dunedin.

Tasmania.—21 power transformers for Hydro-Electric Commission.

Spain.—30 power transformers and switchgear, with 8 km., 3-core, e.h.p. cable, for hydro-electric power scheme.

Proposed Argentine Tariff Revisions.—The *Board of Trade Journal* states that according to information which has been received from the Commercial Secretary at Buenos Ayres, the Tariff Revision Bill, as passed by the Argentine Chamber of Deputies, provides for an increase of 60 per cent. of the valuations inscribed in the Valuation Tariff (this increase to take the place of the 20 per cent. increase already in operation), and for an increase in the specific duties of the Customs Tariff by 25 per cent. It is understood also that, apart from this general increase of valuations, the Tariff Revision Bill as passed by the Chamber embodies (with some few exceptions) the proposals made by the Budget Committee for the increase or reduction (in some cases suppression) of the duties on various articles.

The Commercial Secretary states that it is anticipated that the Bill will be amended in the Senate.

Russian Imports of Electrical Goods.—The *Ost Express* reports that the chief electricity administration, Glavelektro, has submitted to the State Economic Committee a draft plan for regulating the importation of electrical goods into Russia. It provides for the Glavelektro the sole right to import to an extent fixed by the Economic Committee. The entire profits from the imports will be credited to the Russian electrical works. All orders placed with foreign firms are under the supervision of the Foreign Trade Commissariat on the strength of existing general stipulations. The draft especially points out that these stipulations do not interfere with the interests of the Russgostorg, with which an understanding regarding this question has been reached. In order to carry out the new stipulations in a practical manner and in order to control the trade activity of the Russian Electric Trust the Glavelektro, in co-operation with the Electric Trust, intends to establish a limited company, Elektrotorg. The draft also provides for the systematic placing of orders for electrical fittings, to be made by a committee with the participation of the chief consumers.—*Reuter's Trade Service* (Moscow, July 5th.)

Annual Outings.—The fifth annual outing of the staff of the D.P. Battery Co., Ltd., took place on July 7th. The party, which numbered 47, went by road through some of the most picturesque parts of the district to the Derwent Valley, where a short stay was made to view the large reservoirs. They then proceeded to Buxton *via* Hope and Castleton, where a fine view is obtained of the remains of the castle of "Peveril of the Peak." A performance of "When Knights Were Bold" at the Opera House, Buxton, concluded a most enjoyable day.

The indoor and outdoor staffs of Messrs. Francis Polden and Co., Ltd., were favoured with excellent weather upon the occasion of their second annual excursion on Saturday last. The seaside was again selected, and a party of about 60, including the managing director (Mr. F. C. Polden), Mr. Oswald, and the secretary, Mr. Gill, travelled in saloon coaches to Eastbourne. Upon arrival the party lunched at the Royal Hotel and afterwards amused themselves in various ways. A number, including the ladies, walked over the Downs to Beachy Head. Tea was served at the Hotel and the visitors were again free until eight o'clock, when they had to meet at the station. Victoria was reached soon after 10 p.m. and the party dispersed after a most enjoyable day.

Book Notices.—"Les Marées et leur Utilisation Industrielle." By E. Fichot. Pp. vi+256. Paris: Gauthier-Villars et Cie. Price 9 fr.—In this volume, one of the "Science and Civilisation" series, the author first discusses at length the theory of tides and other movements of the sea, after which he describes various schemes for the utilisation of tidal energy for industrial purposes. The former section occupies 198 pages, leaving only 58 for the latter. M. Fichot regards France as being very favourably situated in respect of tidal power, owing to the many indentations in the coast line and to the wide range of height of the tides on the Atlantic littoral. The author relies entirely upon verbal treatment of the subject, no plans being given. A useful bibliography is provided.

Publications of the Massachusetts Institute of Technology, No. 33, "Heat Losses in Conductors," and No. 34, "Another Harmonic Analyser." Boston: The Institute.

"Senior Magnetism and Electricity," by R. H. Jude, M.A., D.Sc., and J. Satterley, M.A., D.Sc. (Second Edition). Pp. 446; 260 figs. Cambridge: University Tutorial Press. Price 6s. 6d.—The principal addition to this new edition of a work which imparts in a simple and concise manner the groundwork of magnetism and electricity is a short section on the principles of telegraphy and telephony.

"A First Course in Heat Engines," by J. W. Hayward, M.Sc., A.M.I.Mech.E. (Second edition.) Pp. 271; 143 figs. Cambridge: University Tutorial Press. Price 4s.—Apart from the usual revision of the text, the only additions made to this second edition are notes on two-stroke engines and high-speed indicators.

"Crystal Receiving Sets and How to Make Them," edited by B. E. Jones. London: Cassell & Co., Ltd. Price 1s. 6d. net.

"Simple Valve Receiving Sets and How to Make Them," edited by B. E. Jones. London: Cassell & Co., Ltd. Price 1s. 6d. net.

"Vector Analysis," by C. Runge. Pp. viii+226; figs. 36. London: Methuen & Co., Ltd. 9s. net.

"Automatic Telephone Systems." Vol. II. By William Aitken, M.I.E.E., A.Am.I.E.E. Pp. xvi+227; 140 figs. London: Benn Brothers, Ltd. Price 35s. net.

Unemployment.—The total of persons wholly unemployed on July 9th was 1,189,100, 2,250 fewer than in a week previously, and 296,778 fewer than at the beginning of the year. The number of persons working short time was 63,200, an increase of 50 during the week.

The London Fair and Market.—There is little of electrical interest in this year's London Fair and Market, which is being held at the Agricultural Hall and closes to-day (Friday).

One electrical novelty is a pocket crystal set for the reception of broadcasting. This is made by MESSRS. CLARK BROS. AND SMITH, toy manufacturers, and is contained in a circular box about 3 in. in diameter and 1¼ in. high. The tuning is fixed, the coil and connections being placed in the bottom of the box and covered with paraffin wax. Above this is the crystal and "feeler" and terminals for earth, aerial, and 'phones. It is claimed that excellent results have been obtained with this small set at a distance of 15 miles from the broadcasting station.

ASTRO ELECTRIC, LTD., whose reflector has already been described in our columns, exhibits several applications of this appliance. Among these is a "daylight" equipment in which an "Ediswan" daylight lamp is employed. The concentration of light by this device is excellent. Another fitting shown is the "Astro-S-Lite," a semi-indirect lighting appliance, constructed of fluted opal glass, giving soft diffused light.

THE RAWLPLUG CO., LTD., has its usual demonstration of the applicability of "Rawlplugs" to a variety of materials—glass, brick, marble, slate, &c.

MESSRS. S. M. MCEWAN & SON display complete outfits for the construction of simple crystal receiving sets, as well as "unit" type equipment coupled up by links.

A number of "Bulle" electro-magnetic clocks are shown by the BRITISH HOROLOGIC, LTD. The "Bulle" clock was described in our issue of July 7th, 1922.

WONDERSIGNS, LTD., demonstrates its magnetic-letter device by which shop-window signs can be easily arranged and altered.

Apart from the above firms, about the only electrical device to be seen is the third-rail toy railway, which is shown by a number of firms.

The Calcutta Exhibition.—A large general exhibition is to be held in the Eden Gardens in December next. It will be in eight sections, including one devoted to engineering, machinery and automobiles.

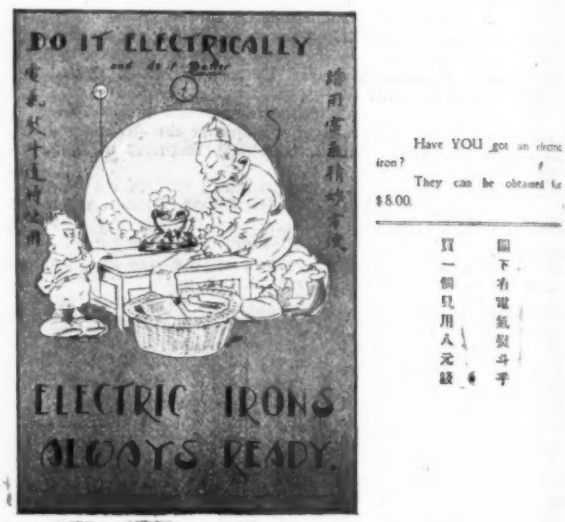
Prohibition and Industry.—We quoted last week in our leading columns a reference made by Sir Eric Geddes to the effect of prohibition upon the workers' output in the United States. We suggested the preparation of a report by an independent authority. We now notice that Sir Eric's brother, Sir Auckland Geddes, British Ambassador at Washington, has prepared such a report, and it has been issued as a White Paper. Among other things, Sir Auckland says that a marked increase, computed at 40 per cent., has taken place in the amount of deposits in savings banks. It is almost impossible, he states, to form any estimate of the extent to which prohibition has contributed to trade recovery.

Russian Affairs.—In a leading article, bearing this title (ELEC. REV., May 18th), we drew attention to the impressions formed by Mr. C. le Maistre, general secretary of the International Electrotechnical Commission, during an extended tour in Russia. We would again direct attention to the subject by quoting the following from last week's *Bulletin* of the Federation of British Industries:—

"We are informed by the secretary of the British Engineering Standards Association, who has just returned from a visit to Russia, that Russian engineers are suffering from a serious shortage of technical literature of all kinds, both scientific and commercial. They have hardly any technical magazines and very few books and are most anxious to receive from technical institutions and trade associations any literature available—periodicals, catalogues, &c.—which would help to meet this need. At the moment, our correspondent states, in order to be certain of delivery, technical literature sent to Russia must be addressed to some institution or recognised organisation. Professor de Chatelain, of the Central Electrotechnical Council of Petrograd, which is authorised to receive technical literature of all kinds, has kindly offered to receive and distribute in any manner designated—*i.e.*, to prospective manufacturers, supply authorities, railway organisations, &c.—publications forwarded to him by British engineers. His address is as follows:— PROFESSOR M. DE CHATELAIN,

Central Electrotechnical Council,
Persp. of 25th October, 6, ap. 7,
Petrograd, Russia."

Publicity in China.—We have received from Tientsin a bunch of pamphlets, &c., designed to draw the attention of the Chinese population to the benefits of electricity. They are published by the British Municipal Council Electricity Department, and in addition to appropriate and humorous illustrations, the leaflets bear electrical "slogans" in both English and Chinese. The rendering into Chinese of such a phrase as "Do it electrically" must have required considerable ingenuity. We seem to detect the influence of our own E.D.A. in some of the prints. The leaflet reproduced herewith depicts very well the efficiency of the electric iron (and the Chinese), and the mystification of the little boy.



Front. Back.

A CHINESE ELECTRICAL DEVELOPMENT LEAFLET.

Lead.—Reporting under date July 14th, Messrs. James Forster & Co. say: "A better tone was in evidence on Monday; in sympathy with other metals, the price of lead advancing 7s. 6d. a ton. This was followed on Tuesday by a further rise of 7s. 6d. a ton, and on Thursday of 2s. 6d. a ton to £24 12s. 6d. for July and £24 7s. 6d. for August. On some free selling yesterday, with few buyers, 5s. a ton of the advance was lost, but the close is quite steady. About 2,000 tons were sold during the week. A fair business has again been put through with customers, and this, coupled with covering of shorts for July and August delivery, is mainly responsible for the advance."

Copper and Lead Prices.—Messrs. F. Smith & Co. report, July 17th: Copper (electrolytic bars), £73, increase; ditto, ditto, sheets, no change; ditto, ditto, wire rods, £83, increase; ditto, ditto, h.c. wire, 10 5/16d. decrease. Messrs. James and Shakespeare report, July 18th: Copper bars (best selected), sheet and rod, £100, £2 increase. English pig lead, £25 5s., 10s. decrease.

Holidays.—The works of the ARTIC FUSE AND ELECTRICAL MANUFACTURING CO., LTD., of Birkenhead, will be closed from August 6th to 11th inclusive for the holidays.

The works and offices of MESSRS. ALLEN WEST & CO., LTD., Brighton, will be closed from August 4th to 12th inclusive for the summer holidays.

Capital Reductions.—KALGOORLIE ELECTRIC POWER AND LIGHTING CORPORATION, LTD., AND REDUCED.—On June 14th the High Court made an Order confirming the reduction of the company's capital from £225,000 to £50,005.

EDISON SWAN ELECTRIC CO., LTD., AND REDUCED.—Notice is given that a petition for the reduction of the company's capital from £1,198,307 to £432,565 will be heard by the High Court on July 31st.

Applications for British Trade Marks.—The following are among the recent applications for British trade marks. Objections to any of them may be made within one month from the dates mentioned. In the case of foreign applications the names and addresses of the British representatives are also given:—

Magneti Marelli (lettering and design). No. 425,250. Class 6. Magnetos for internal combustion engines. Fabrica Italiana Magneti Marelli, Via, 8, Radegonda, Milan, Italy. (Haseltine, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.) July 11th, 1923.

Faeritone. Radio apparatus (lettering and design). No. 432,272. Class 8. Wireless telephone receivers and component parts. Cyril W. Garrett, trading as the Mechanical Utilities Co., 20, St. Quintin's Avenue, London, W.10. July 11th, 1923.

Astrophone. No. 435,541. Class 8. Instruments and apparatus for use in wireless signalling. Amplifiers, Ltd., 49, Parliament Street, London, S.W. July 11th, 1923.

Extravox. No. 435,839. Class 8. Telephonic apparatus. Edward A. Graham, trading as Alfred Graham & Co., Crofton Park Road, London, S.E.4. July 11th, 1923.

Audiola. No. 435,842. Class 8. Telephonic apparatus. Edward A. Graham, trading as Alfred Graham & Co., Crofton Park Road, London, S.E.4. July 11th, 1323.

Clairvox. No. 437,642. Class 8. Wireless telephony receiving sets. The Kent House Engineering Co., Ltd., 32, Fenchurch Street, London, E.C. July 11th, 1923.

Monarch. No. 437,064. Class 13. Electric irons. Josiah M. Wallwin, Saltisford Ironworks, Birmingham Road, Warwick. July 11th, 1923.

Boiler Contracts.—We understand that MESSRS. CLAYTON AND SHUTTLEWORTH, LTD., Lincoln, who are making rapid strides in connection with the "Clayton" patent water-tube boilers, have just secured an order for two of their sectional type boilers from the Electricity Department of the Tunbridge Wells Corporation. In addition they are executing contracts for very large boilers, for, amongst others, the London County Council, the Yorkshire Electric Power Co., the London, Midland and Scottish Railway Co., and the Frodingham Iron and Steel Co., Ltd.

Haulbowline Dockyard.—In our advertisement columns to-day the Government of the Irish Free State invites offers for the lease of the Haulbowline Dockyard, situated at the mouth of Cork Harbour. It is stated that ample storage accommodation is available, as well as cargo-handling equipment.

LIGHTING AND POWER NOTES.

Aylesbury.—ELECTRICITY CHARGES.—The Town Council has applied to the Ministry of Transport for an Order to fix the maximum charge for electricity at 9d. per kWh, with minimum payments of 11s. 3d. for the winter quarters and 7s. 6d. for the summer quarters.

Bulkington.—ELECTRICITY SUPPLY.—The Urban District Council is entering into a ten-years' agreement with the Leicestershire and Warwickshire Electric Power Co. for a supply of electricity.

Burley-in-Wharfedale.—ELECTRICITY SUPPLY.—The Electrical Distribution of Yorkshire, Ltd., has applied for a Special Order authorising it to supply electricity in the urban district and adjacent parishes.

Burnham (Bucks.).—ELECTRICITY SUPPLY.—With a view to obtaining a supply of electricity from the Slough and Datchet Electricity Co., a canvass is to be made of residents in the district.

Carlisle.—INAUGURATION OF PLANT.—The new 3,000-kW turbo-alternator which has recently been installed at the electricity works, was formally started up by the Mayor (Mr. R. Dalton) on July 10th.

Continental.—SPAIN.—After prolonged negotiations, there has just been completed an arrangement whereby the Barcelona Traction, Light and Power Co. will practically obtain control of the Energia Electrica de Cataluna. The latter company is an enterprise hitherto run by French capitalists, but these have agreed to dispose of their interests to a company with Spanish capital, controlled by the British company. The effect of the arrangement is that the Barcelona Traction, Light and Power Co. will in future have complete control of 85 to 90 per cent. of the electric power business in Barcelona and the districts surrounding that city. Not only will it assist the earning power of the company, but the arrangement should lead to considerable economies in working, and an improved service.—*The Times*.

Dartford.—ELECTRICITY SUPPLY.—The Urban Council has sealed an agreement for the supply of electricity for power to the purification works of the West Kent Main Sewerage Board, with a guaranteed minimum consumption of 27,500 kWh per quarter, on a 100-kW demand basis, and a loan of £3,750 has been applied for to cover the estimated cost of the necessary cable and switchgear.

Dover.—OPPOSITION TO ORDER.—The Rural Council has decided to object to the application of Sir C. Bright & Partners for an Order to supply electricity to parishes in the district, including Ringwould and St. Margaret's. The latter parish has already a supply from Dover.

Dudley.—WORKHOUSE LIGHTING.—The Board of Guardians has decided to install electric lighting in the workhouse, and to invite tenders for carrying out the work. It is estimated that by substituting electricity for gas lighting a saving of £300 per annum will be effected.

Grimsby.—YEAR'S WORKING.—The report of the borough electrical engineer (Lt.-Col. W. A. Vignoles) for the year ended March 31st last shows that the revenue amounted to £81,311, as compared with £82,747 in the preceding year. Working expenses were reduced to a greater extent—from £54,174 to £47,428, increasing the gross profit from £33,408 to £28,413. The capital charges remained at approximately the same figure, leaving a net profit of £9,779, as against £4,867 in 1921-22. The sales of energy increased from 5,272,929 to 7,346,760 kWh, the principal rise occurring in supplies to private consumers. The capital expenditure during the year totalled £19,445, the largest single item being £11,690 for mains and services. During the year the maximum load was 3,300 kW, which was about 500 kW in excess of the "safe" capacity of the plant. There was a delay in the installation of new plant.

LOAN SANCTIONED.—The Electricity Commissioners have sanctioned the borrowing of £75,000 for extensions to the electricity works, including the installation of a 3,000-kW turbo-alternator.

Heywood.—YEAR'S WORKING.—The report of the electrical engineer (Mr. H. C. Day) on the working of the electricity undertaking for the year ended March 31st last shows a total income of £19,933, as compared with £20,023 in the previous year. Working expenses amounted to £10,087 (£16,275), leaving a gross profit of £9,906. After providing for interest, sinking fund charges, &c., there was a net surplus of £1,091, as compared with a deficit of £1,047 in the previous year. The number of kWh sold was 2,454,486, an increase of 28 per cent., and the works cost was 1.40d. per kWh, as compared with 2.07d.

Irish Free State.—KINGSTOWN (CO. DUBLIN).—The Free State Ministry of Industry and Commerce has directed a public inquiry into the application of the Urban District Council for sanction to raise a loan of £33,000 for the erection of a generating station.

Knighton.—STREET LIGHTING.—The Urban Council has accepted the tender of the Electric Lighting Co. for public lighting from August 24th to the middle of April at £125. The tender of the gas company was £147.

Lossiemouth.—PRICE INCREASE.—The Town Council has decided to increase the charges for electricity for lighting from 8d. to 10d. per kWh and for power to 4½d. per kWh, with a minimum charge of 10s. per half year.

Lowestoft.—NEW PLANT.—The Town Council is installing a 300-kW set at the electricity works, and has applied to the Electricity Commissioners for sanction to the borrowing of a loan to cover the cost.

Portsmouth.—LOAN.—The Town Council has applied to the Electricity Commissioners for sanction to a loan of £12,000 for cables along the route of the proposed new road from Gladys Avenue to Hilsea Lines.

Malvern.—LOAN.—The Urban Council has applied to the Electricity Commissioners for sanction to a loan of £11,000 for extensions to the electricity works.

Newmill (Huddersfield).—ELECTRICITY SUPPLY.—At a recent meeting of the District Council, the Electricity Committee presented a report stating that the provisional terms offered by the Yorkshire Electric Power Co. for a supply to the district were considered very satisfactory. A canvass of the district had been made, with encouraging results. The Council was now in a position to submit a scheme for the provisional sanction of the Electricity Commissioners.

Price Reductions.—Reductions in the charges for electricity have been made in the following districts:—

HEREFORD.—Power: 2½d. per kWh for the first 250 hours; 2¼d. per kWh for the next 25 hours; and 1¾d. beyond.

PORTSMOUTH.—Lighting within the borough: First 5,000 kWh per annum, 5½d. per kWh; next 5,000, 5d. per kWh; next 10,000, 4d. per kWh; beyond, 3½d. per kWh. Power: First 20,000 kWh per annum, 1¼d. per kWh; beyond, 1d. Charges outside the borough:—Lighting: An addition of 2d. per kWh to prices within the borough. Power: An addition of ¼d. per kWh. Supply through slot meters is reduced from 7½d. to 6d. per kWh.

ROTHERHAM.—Lighting: From 50 per cent. to 25 per cent. above the pre-war rate. Power: From 75 per cent. to 50 per cent. above the pre-war scale.

ASHTON.—Lighting: A reduction of ½d. per kWh.

Rothesay.—ELECTRICITY SUPPLY.—In connection with the electricity scheme, the Town Council is applying to the Electricity Commissioners for sanction to borrow £4,000 for public street lighting, £7,000 for private lighting and power, and, later on, £20,000 for the erection of a new generating station.

Sheffield.—YEAR'S WORKING.—The accounts of the municipal electricity undertaking (engineer: Mr. S. E. Fedden) for the year 1922-23 record a total revenue of £793,235 and working expenses amounting to £342,706, leaving a gross balance of £450,529. The equivalent figures for the previous year were:—Revenue, £796,423; expenditure, £522,845; balance, £273,578. After the payment of capital charges there remained a net profit of £173,916, comparing very favourably with the surplus of £11,824 in the previous year. The profit was allocated as follows:—Relief of rates, £34,818; renewals and special expenditure fund, £100,000; and reserve fund, £39,098. A total of £92,061 was spent on capital account during the year, bringing the total expenditure up to £3,803,943. Mains and services cost £66,828 and sub-stations £18,909. The outstanding debt upon the undertaking at March 31st was £2,652,754. There was an increase in the amount of energy sold from 103,170,062 to 123,438,177 kWh, the principal increase being over 16 million kWh in energy supplied for power purposes. During the year the plant capacity was increased from 93,000 to 98,500 kW; the maximum demand rose from 63,014 to 64,186 kVA.

South-West Midlands Electricity District. — ADVISORY BOARD.—The Order made by the Electricity Commissioners, after two local inquiries, constituting the South-West Midlands Electricity District, has been confirmed by the Minister of Transport, and was approved by both Houses of Parliament on June 19th, from which date the Order comes into effect. The first meeting of the Advisory Joint Committee established under the Order was held in Birmingham on Thursday (12th inst.), when Mr. Councillor Beale was appointed chairman, and Mr. E. J. Jennings secretary. The S.W. Midlands Electricity District comprises portions of the counties of Shropshire, Stafford, Warwick, and Worcester.

Tiverton.—ELECTRICITY SUPPLY.—The Borough Council has applied for a Special Order authorising it to construct a power station and to supply electricity in the district.

Truro.—ELECTRICITY SUPPLY.—The Electric Light Committee has recommended the Town Council to adopt a scheme under which the Cornwall Electric Power Co. will supply electricity at 10d. per kWh for lighting and 5d. per kWh for power.

Walsall.—MAINS EXTENSIONS.—On the recommendation of the Electricity Committee, the T.C. has decided that, with a view to providing work next winter for the unemployed, extensions to the mains in various parts of the town shall be carried out, subject to the Electricity Commissioners sanctioning the borrowing of £5,000.

Westbury-on-Severn.—SPECIAL ORDER.—The Urban Council has consented to the application of the West Gloucestershire Power Co. for a Special Order authorising it to distribute electricity within the Council's area.

TRAMWAY AND RAILWAY NOTES.

Belgian Congo.—RAILWAY ELECTRIFICATION.—M. Franck, Belgian Minister for the Colonies, has just foreshadowed the electrification of the railway from Matadi to Leopoldville. This railway is the great import and export route for the Congo from the Atlantic side, and at present the steam locomotives consume coal, which has to be imported at high cost from Europe. Investigations made by the Congo Railway Company show that by utilising the falls of the river it will be possible to obtain more than 100,000 h.p., of which only 30,000 h.p. would be required at first for electric traction on the railway. The expenditure on the establishment of the hydro-electric works and the conversion of the railway is estimated at 50,000,000 fr., which sum will be advanced to the company by the Government—which, together with the colony, holds most of the existing share capital. It is proposed to widen the gauge of the railway, which will continue to be a single line, from 75 cm. to 1.06 m., and the entire work is expected to be completed in from four to five years. The duration of the journey between Matadi and Leopoldville, which now occupies two days, will be reduced to one day.

Continental.—NORWAY.—The opening has taken place of electric railway communication between the Baltic and the Atlantic through the completion of the Norwegian Ofoten railway between the Swedish frontier and the port of Narvik. Work on the latter railway has been in progress since the summer of 1920, the object in view being mainly to secure continuity in the electric railway transport of Swedish iron ore from the district of Kiruna to the Norwegian ice-free port of Narvik. With the opening to traffic of the Ofoten railway the whole length of line from Lulea, in the Baltic, to Narvik, on the Atlantic Ocean, has now been brought into electrical operation, and the power for the working of the entire route is obtained from the Porjus hydro-electric works in Sweden.

Liverpool.—NEW ROUTES.—The Corporation's scheme for extending the tramways in the Woolton, Gateacre, Allerton, Garston, Clubmoor and Walton districts formed the subject of an inquiry on July 13th by the Ministry of Transport. No opposition was raised.

London.—TUBE STRIKE ENDED.—The men employed on the reconstruction of the City and South London Tube have returned to work, pending a settlement with regard to the proposed wages reduction. An early meeting of the Conciliation Board is to be held.

L.C.C. TRAMWAYS.—The London County Council is applying for an extension of the time allowed for the construction of the following lines:—(i) Junction line between Clerkenwell Road and Farringdon Road; (ii) junction line between Mitcham Road and Southcroft Road; (iii) junction line between Dulwich Road and Norwood Road; (iv) junction line between Mare Street and Well Street, Hackney; and (v) the tramways in Eltham Road and High Street, Eltham.

CITY AND SOUTH LONDON RAILWAY.—Writing to *The Times* with reference to the City and South London Railway Bill, which, as mentioned in our "Parliamentary Notes," was rejected by a Committee of the House of Lords this week, Sir H. A. Walker, of the Southern Railway Co., stated that negotiations were proceeding between his company and the promoters of the Bill, which it was hoped would have a satisfactory result and prove beneficial to the great majority of the population which would have been served by the proposed extension.

Middlesex.—TRAMWAY EXTENSION.—The Middlesex County Council has approved the construction of a double tramway track along Broad Lane, The Hale, and Ferry Lane, from the High Road, Tottenham, at an estimated cost of £185,950. These routes will link up with the Walthamstow tramways at the Essex boundary.

Shields.—PROPOSED TYNE TUBE.—An interesting proposal for the construction of a tunnel under the river Tyne to connect the borough of Tynemouth with that of South Shields, is at present being discussed by the respective Town Councils. It is proposed to construct a tunnel, 13 ft. wide, from Bedford Street, North Shields, to a point opposite, in South Shields. There would be a five-minute service of electric shuttle cars. It is suggested that a company should be formed with a capital of £300,000, the two Corporations to guarantee the prior charges, and 5 per cent. on the ordinary shares. At a special meeting of the South Shields Council on July 9th it was agreed that a joint sub-committee representing the two Corporations should go into the question and submit a report.

Sunderland.—NEW ROUTES.—The Town Council has authorised the necessary steps to be taken for the extension of the tramway system from Sea Lane to Whitburn, a distance of 1¼ miles, at an estimated cost of £16,000; and to Silksworth, a distance of 3¼ miles, at an estimated cost of £48,800.

TELEGRAPH & TELEPHONE NOTES.

RADIO-TELEPHONY AND TELEGRAPHY.

Austria.—RADIO-TELEGRAPHY.—The Austrian Marconi Co. has been formally constituted at Vienna, says the *Financial Times*. Marconi's Wireless Telegraph Co., Ltd., of London, subscribed £93,000 and the Austrian Government £40,000 of the £133,000 capital of the concern. The company has the exclusive right to conduct radio-telegraphy between Austria and all other countries for a minimum period of 30 years. Several new stations will be erected, and traffic will commence before the end of the year.

British West Indies.—RADIO BROADCASTING.—The West India Committee, which announced last year that a radio station had been successfully established in the Turks and Caicos Islands, now reports that, through the enterprise of a local newspaper, the *Trinidad Guardian*, which has set up a receiving station at Port of Spain, Trinidad is picking up news from American broadcasting stations.—*Financier.*

China.—RADIO COMMUNICATION.—The Chinese Government Bureau of Economic Information reports that a survey of locations along the Yangtze River for the installation of radio telegraph stations for military purposes has been completed, and Admiral Tu Hsi-kwei has submitted a report to the Central Government. The positions for stations recommended are Kweifu, Wuchang, Kiukiang, Tungling, Shanghai, Shashih, Wusueh, Hwaining, and Nanking. The cost of installation will be borne by the Central Government, any deficiency to be met by appropriations from the provincial treasuries of Hupeh, Kiangsi, Anhwei, and Kiangsu.

Italy.—RADIO TELEGRAPHY.—The Department of Overseas Trade has received translations of Royal Decrees Nos. 1,067 and 1,262, which contain regulations concerning the radio service in Italy, and the granting of concessions and licences to companies, public bodies, and private individuals for the installation and use of radio plant. They may be inspected

by interested United Kingdom parties on application to the Department.

Radio-Broadcasting.—NEW STATION.—The new broadcasting station at Aberdeen is to be situated in Union Grove, while a site for the studio has been found in Belmont Street.

Venezuela.—RADIO SERVICE.—A Government radio-telegraph service has recently been established between the South American Republics of Venezuela and Colombia.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

OPEN.

Audenshaw.—July 30th. Electric lighting installation at St. Stephen's Church. Specifications (£1 1s., returnable) from D. C. Rolls, hon. sec., Church Council, 59, Audley Street, Cockbrook, Ashton-under-Lyne.

Australia.—MELBOURNE.—August 8th. Victorian Government Railways. Three-phase a.c. induction motors, starting apparatus and accessories.*

October 24th. Two one-ton electric hoists with trolley wires and current collectors.—*Reuter's Trade Service* (Melbourne).

Victorian Electricity Commission. October 6th. Specification No. 23/117, 22,000-V insulators in connection with the Morwell power scheme. (See this issue.)

COMMONWEALTH GOVERNMENT.—Various dates. Cable distributing terminals, bells, cords, and plugs; switchboards; telephone parts; and submarine cables. (See this issue.)

SOUTH AUSTRALIA.—September 18th. Harbours Board. Four 7-ton electric travelling coal-unloading cranes.—*Reuter's Trade Service* (Melbourne).

Basford (Nottingham).—July 26th. Guardians of the Poor. Installation of electric lighting at the Bulwell Institution, including underground mains. (See this issue.)

Belgium.—Tenders have been invited by the municipal authorities of Bassenge (Province of Limbourg) for the concession for the distribution of electrical energy for lighting and power purposes in the town.

July 25th. The Office d'Electricité of the Belgian State Railways, at 25, Rue de la Charité, Brussels. Establishment of high-pressure current reception and transformer boxes at Ath and Bourg-Leopold.

Municipal authorities of Mazée (Province of Namur). Establishment of an electricity supply system in the town.

July 31st. Municipal authorities of Looz (Province of Limbourg). Establishment of a low-pressure electricity distribution system in the little towns of Looz, Grand-Looz, Kerniel, Gors-op-Leeuw, Wintershoven, and Wimmertingen.

Bristol.—August 1st. Electrical Committee. Self-cleaning water-screening plant (2½ million gal. per hour capacity). (July 13th.)

Canada.—TORONTO CITY COUNCIL.—August 21st. The Council is inviting tenders for the supply and installation, at the Strachan Avenue sewage-pumping station, of two 2,880,000-gal. centrifugal sewage pumps, direct-connected to 3-phase induction motors.*

Canary Islands.—The authorities of the Canary Islands at Santa Cruz de Tenerife have just invited tenders for the establishment of a system of telephonic communication with a number of exchanges throughout the Island of Tenerife.

Doncaster.—August 6th. Electricity Department. One 1,250-kW rotary converter and l.p. switchgear. (See this issue.)

Dublin.—July 30th. Electricity and Public Lighting Committee. Supply and erection of transformers during a period of one year. Tenders, enclosing one guinea, must be sent to the Town Clerk and Secretary to the Committee, Fleet Street, Dublin.

Dudley.—July 25th. Board of Guardians. Installation of electric power at the Institution. (See this issue.)

Eccles.—August 4th. Electricity Department. Two 200-kW sets for converting 6,600-V, 3-phase a.c. to d.c. at 550 V. (See this issue.)

Edinburgh.—July 23rd. Tramways Department. Supply and delivery of eight top-covered car bodies. Forms, &c., from the manager, 2, St. James' Square, Edinburgh; tenders to be sent to Town Clerk.

France.—PARIS.—French War Office. Supply of 30 km. of single-wire four-circuit telegraph cable and 30 km. of single-wire double-circuit ditto.

Glasgow.—August 2nd. Electricity Department. Various works required in connection with erection of joiners', painters', and general workshops at Dalmarnock power station. Forms, &c., from electrical engineer.

33,000 tons and 150,000 tons, more or less, of coal (singles and pearls) for the electricity generating stations. Forms, &c., from Mr. R. B. Mitchell, engineer, 75, Waterloo Street.

Grays.—July 31st. Electricity Department. Two 350-kW converting sets, with two 400-kVA static transformers, and switchgear. (July 13th.)

Greenock.—July 28th. Corporation Electricity Department. Erection of overhead transmission lines between the Greenock and Paisley power stations, &c. (See this issue.)

Ilford.—July 24th. Urban District Council. E.h.p. and l.p. switchgear, and l.p. lead-covered and armoured cable. (July 13th.)

Leeds.—September 3rd. Electricity Department. Supply and erection of 3-phase switchgear. (See this issue.)

London.—L.C.C. TRAMWAYS.—August 13th. Supply and erection of pipework and de-aerating plant at Greenwich power station.

LAMBETH.—July 24th. Board of Guardians. Installation of electric lighting and fittings at the Renfrew Road relieving station. (July 13th.)

New Zealand.—August 21st. Public Works Department. Supply of a steel runway for a crane at Khandallah substation, section 84, Mangahao. The amount of deposit is £25, and the amount of bond £35. Sealed tenders are to be lodged with the Secretary, Public Works Tenders Board, Wellington.*

February 28th, 1924. Contract for Section 1, headworks, &c., Arapuni hydro-electric power scheme.*

AUCKLAND.—August 9th. Municipal Tramway Department. Two miles 7/12 galvanised steel span wire; 1 mile No. 12 h.d. copper wire; 2 miles 37/.083 triple-braided aerial cable; 500 yards 37/.083 lead-sheathed cable, joint boxes, &c.; and 12,000 ft. of glazed earthenware troughing. Particulars and specifications from Downie Bros., 7, Fenchurch Avenue, E.C.3.

Pentre, Rhondda.—July 23rd. Rhondda Urban District Council. Three 150-kVA, 3-phase static transformers. (July 6th.)

Salford.—July 30th. Ten covers for tramcars. Particulars from general manager, Tramways Department, 32, Blackfriars Street, Salford.

Sheffield.—July 30th. Electric Supply Department. Contract No. 317. Laying 6-in. c.i. socket and spigot pipes, valve, strainer, concrete stools, manholes, &c., for conveying water along Club Mill Lane, Neepsend. Form of tender and specifications (£2 2s.) obtainable from Mr. S. E. Fedden, general manager and engineer, Commercial Street, Sheffield.

Uruguay.—MONTEVIDEO.—State Electricity Works. August 16th. Electrical accessories.*

Warrington.—July 24th. Electricity and Tramways Committee. E.h.p. sub-station ironclad switchgear, and 12 months' supply of earthenware conduits. (July 13th.)

Wigan.—August 9th. Board of Guardians. Electrical vertical pumping plant, &c. (July 6th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

CLOSED.

Belgium.—There was keen international competition last week for the contract for the supply of 7,350 metres of low-pressure armoured cable to the municipal authorities of Schaerbeek. Two Belgian, one Dutch, one French, and two British concerns (the British Insulated & Helsby Cables, Ltd., and Callender's Cable & Construction Co., Ltd.) submitted tenders for the order, the lowest being that of Callender's Co.

Bolton.—Electricity Committee. Accepted:—

Erection of a sub-station in Crescent Road and Weston Street.—R. J. Tyson.

The managers of All Saints' School have accepted the tender of the Corporation Electricity Department for the installation of electric lighting throughout the school.

Tramways Committee. Accepted:—

Points and crossings.—Hadfields, Ltd.

600 tons of steel tram rails.—Cargo Fleet Iron Co., Ltd.

Bury St. Edmunds.—Town Council. Accepted:—

Pillar-box in connection with the electricity supply (£85 17s.).—W. T. Henley's Telegraph Works Co., Ltd.

Dewsbury.—Board of Guardians. Accepted:—

Internal telephone installation at the Institution (£319).—F. Whitton and Sons.

London.—The Central Electric Supply Co., Ltd., Grove Road, N.W., has placed with Messrs. Richardsons, Westgarth and Co., Ltd. (London agents: British Central Electrical Co., Ltd.) a repeat order for condensing plant for a 15,000-kW turbo-generating set, the condenser to be of the contraflo type, with two jet steam ejectors and duplicate motor and turbine-driven condensate pumps, together with bleeder feed heater and pipework.

BATTERSEA.—Electricity Undertaking Committee.—The Committee has accepted the following tenders for the supply of goods until March next:—Cables, &c.—Callender's Cable and Construction Co., Ltd. Electricity meters.—Chamberlain and Hookham, Ltd.; Ferranti, Ltd.; and the Reason Manufacturing Co., Ltd.

SHOREDITCH.—Lighting Committee.

Coal bunkers:—

Babcock & Wilcox, Ltd.	£3,513
Fraser & Chalmers	5,358
Goodall, Clayton & Co.	3,816
John Child	4,659
The New Conveyor Co.	3,290
Rownson, Drew & Clydesdale, Ltd.	3,690
Structural Engineering Co. (Recommended.)	**2,805**
Industrial Constructions, Ltd.	Not to specification.

One 1,500-kW converting plant:—

Mather & Platt, Ltd. Self-synchronising. Range obtained by tappings on l.p. side of transformer	£5,828
Mather & Platt, Ltd. Self-synchronising. Range obtained by tappings on l.p. side of transformer	6,730
General Electric Co., Ltd. Rotary converter. Reactance control. Tappings on h.p. side. (Recommended.)	**5,721 10**
Ditto	6,651
British Thomson-Houston Co., Ltd. Rotary converter. Self-synchronising	6,222
Bruce Peebles & Co., Ltd. Motor converter	6,527
Metropolitan-Vickers Electrical Co., Ltd. Rotary converter. Reactance control	6,450
English Electric Co., Ltd. Rotary converter. Reactance control	6,010

Two superheaters:—

Babcock & Wilcox, Ltd. (Recommended.)	£1,475

Ventilating apparatus at Coronet Street sub-station:—

Davidson & Co. (Recommended.)	£333

L.C.C. TRAMWAYS.—The Highways Committee has accepted the undermentioned tenders:—

Welding of about 700 rail joints:—

The Rail Welding Co., Ltd. (Accepted.)	**£437 10**
The Woods-Gilbert Rail Remodelling Co., Ltd.	577 10
The Scholey Construction Co., Ltd.	595 0
Thermit, Ltd.	980 0

Two electric welding equipments:—

The Equipment & Engineering Co. (Accepted.)	**£560 18**
The General Electric Co., Ltd.	610 0
Metropolitan-Vickers Electrical Co., Ltd.	632 18
Ditto. (Alternative.)	810 18
The Premier Electric Welding Co., Ltd.	718 0
Ditto. (Alternative.)	637 4
Scholey Construction Co., Ltd.	731 0
Alloy Welding Processes, Ltd.	767 0

Two portable electrically-driven grinding machines:—

†Buck & Hickman, Ltd.	£446 12
†Woods-Gilbert Rail Remodelling Co., Ltd.	521 4
Rail Welding Co., Ltd. (Accepted.)	**576 12**
The Equipment and Engineering Co.	734 0
Ditto. (Alternative.)	1,965 0

† Not to specification.

Repairs to turbine rotor wheel:—

Metropolitan-Vickers Electrical Co., Ltd.	£350 0

Heightening of bulkheads in coal bunkers at Greenwich power station:—

E. C. & J. Keay, Ltd. (Accepted.)	**£950 0**
J. & C. Bowyer, Ltd.	987 0
J. Garrett & Son	1,120 0
T. D. Leng	1,165 0
Walter Jones & Sons, Ltd.	1,173 0
Thomas & Edge	1,197 0
P. & W. Anderson, Ltd.	1,200 0
The Somerville-Barnard Construction Co., Ltd.	1,228 15

Portsmouth.—Town Council. Accepted:—

Switchgear for sub-stations (£2,651).—English Electric Co., Ltd.

NOTES.

Electric Cooking in the United States.—According to Mr. J. V. Strange, of the Pacific Power & Light Co., quoted in the *Electrical World*, the Washington Water Power Co., in the course of a recent six weeks' campaign, sold 431 electric cooking ranges, with each of which a water heater was supplied, the joint rating being 7 kW. This is said to be a record result. The average price of the installation was $249.75—say £50—and the terms were $9.75 down, with a minimum monthly payment of $10. Before the campaign began there were 4,030 electric cookers in service in the area, the work of 10 years' development; the population concerned numbered 170,000, of whom 32,200 were residential consumers, and the proportion of the latter using electric cookers is now 13.9 per cent. The gross revenue for energy resulting from the campaign is estimated at $39,000 a year. In part of the area gas is available for cooking, and coal and wood are relatively cheap.

Splitting and Sizing Mica.—A correspondent inquires whether any of our readers will give him any information regarding the methods used for splitting and sizing mica.

Permanent Magnets.—In a paper on permanent magnets and the relation of their properties to the constitution of magnet steels, published in the June issue of the *I.E.E. Journal*, Mr. E. A. Watson deals, first, with the properties required in a permanent magnet. It is shown that in all cases, provided the magnet is properly proportioned to its work, the true criterion is the (BH) *max* value. The relationship existing between the values of saturation density, remanent density, coercive force and (BH) *max* is then considered, and a modified form of Kennelly's or Lamont's law is developed, which enables this relationship to be expressed both analytically and graphically. In practice magnets of homogeneous composition obey this law very closely indeed. The paper next deals with magnets that are microscopically not of uniform composition, which contain two principal constituents. The relation between the magnetic properties of the magnet and the grouping of the constituents is considered, in addition to its relation to their magnetic properties. The constituents may fall under three headings: (*a*) non-magnetic, (*b*) magnetic and possessed of high coercive force (magnetically hard), and (*c*) magnetically soft, *i.e.*, magnetic, but of low coercive force. Evidence shows that the highest values of (BH) *max* are obtained when the magnet consists uniformly of a material of class (*b*), and that with the right steels and appropriate heat treatment other constituents are absent. The constituent in question is, however, only a transition product between the other two classes (*a*) and (*c*), and its presence in the pure state is, therefore, not always easy of attainment.

Data taken chiefly from modern cobalt steels are given in support of the theories put forward, and the conclusions come to by the author are:

(1) The properties of a properly hardened permanent magnet may be represented to a sufficient degree of accuracy for most practical work by the relation of Lamont's law, and the graphical construction derived therefrom may be used to predict the complete performance of the magnet when three points on the curve are known.

(2) The properties of an actual magnet depend upon (*a*) the constituents present; (*b*) their grouping and micrographical constitution. With the same constituents arranged in different ways widely divergent results may be obtained.

(3) The constituent which should be aimed for is the first transformation product below the γ or non-magnetic condition. This should form the whole mass of the magnet. In actual magnets it may occur associated with (*a*) unchanged ν material; (*b*) further stages in the transformation to the soft or α condition.

(4) In magnets in which a non-magnetic constituent is present, much less harm is produced by its presence when it forms the centres of cells of magnetic material than when it is interspersed between magnetic particles. In most magnets which have a granular structure any γ constituent is usually present in the centre of the grains and acts chiefly as a diluent. It may sometimes cause a slight increase in coercive force. In cases where the non-magnetic constituent surrounds and separates the magnetic particles a very great reduction of remanence and (BH) *max* occurs. In such a case the ratio of saturation to remanent density is very large. Such a condition appears to occur in steels which are made magnetic by subsequent supercooling, *e.g.*, in liquid air. A steady cooling from the hardening temperature without any pauses which may arrest the process of transformation appears to be desirable.

(5) In order to comply with (3) above the ($\gamma - \beta$) transformation should take place at the lowest temperature consistent with the transformation being completed at atmospheric temperature. The cooling rate appropriate to this will depend upon the composition of the steel and the hardening temperature. In order to ensure uniformity throughout the mass of the magnet the temperature gradient throughout it must be small so that the whole of the material cools at the same controlled rate. Hence the superiority of air- or oil-cooled steels, especially for large sections.

(6) The expansion of the material when changing from the γ to the β state has an important bearing upon the phenomena of hardening. It tends to broaden the region covered by the transformation and to assist the retention of non-magnet centres in the grains. On this account a coarse-grain structure is liable to give poor magnetic results.

Service Notes.—Lieutenant W. J. Rawlings, from the London Electrical Engineers, has been appointed to the 11th Anti-Aircraft Battalion, London. Captain R. L. Aiken, O.B.E., M.I.E.E., from the Territorial Army Reserve, has been posted to the Corps of Royal Engineers (Electrical) Reserve. In the last few weeks a number of officers who served with electrical units during the war have been posted to the Territorial Army Reserve for duty.

Lieut. H. A. Voss has just relinquished his commission in the London Electrical Engineers, retaining his rank. He saw a good deal of service in the late war, and was mentioned in despatches in 1919.

(Continued on page 104.)

HIGH-SPEED RADIO-TELEGRAPHY.

Marconi's Central Control Organisation.

The ascendancy of continuous-wave radio-telegraphy by means of thermionic valve transmission and the distant control of the transmitting and receiving stations from a central office is typically exemplified by the group of

Fig. 1.—Radio House Operating Room.

stations of Marconi's Wireless Telegraph Co., Ltd., comprising Radio House, Ongar, and Brentwood, to which a visit of inspection was paid on June 27th by the members of the industrial group of the House of Commons with the object of demonstrating how commercial services are conducted therefrom with France, Switzerland, Spain, Canada, and the U.S.A.

The Ongar transmitting stations and the Brentwood receiving station are in Essex, some 20 miles from London, but full control is centred in the City at Radio House, the relaying of the signals from the land lines to the transmitters and from the receivers to the land lines being an entirely automatic process. The transmitting plant at Carnarvon in North Wales (call signal M U U; wave length, 14,200 metres) used for communication with the U.S.A. is also controlled automatically from Radio House. Messages are thus actually dispatched from the building where they are handed in by the public, and all the telegraphist staff is concentrated in one building under the personal supervision of the operating controller.

From the counter in the public office at Radio House

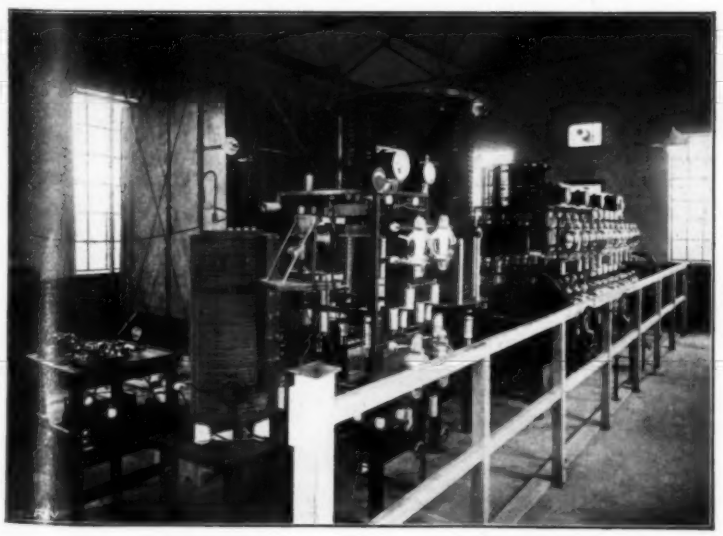


Fig. 2.—Ongar "C" Transmitting Station.

a conveyor runs into the main operating room and deposits the messages on the "circulation" table, which is equipped with time-saving devices that enable each message to be distributed rapidly to its proper circuit. It is then reproduced in Morse characters in the form of perforations in paper tape, which is done by means of a keyboard perforator. The tape is next fed into an automatic high-speed transmitter which actuates the radio plant at Ongar or Carnarvon, according to the destination of the message, and beside each instrument there is the receiving instrument for that particular service; thus it is possible for the operator to receive immediate acknowledgment of the messages he sends. Fig. 1 is a view at Radio House, showing the "circulation" table, automatic conveyors, and (on the right) some of the operating tables for the Continental circuits, showing the paper tape passing through the printer and being gummed on message forms. The high-speed automatic apparatus employed in reception on the European circuits operates a printer that transforms the signals into Roman characters and prints them on paper tape, which is drawn through a gumming machine and affixed in suitable lengths to a delivery form. The message

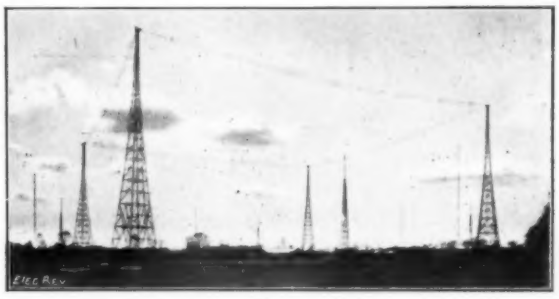


Fig. 3.—Brentwood Receiving Aerials.

may then either go (i) to the telephone room, or one of the private wire circuits, for immediate transmission to the addressee, or (ii) by way of an automatic conveyor to the "unpacking" room where, with the aid of a comprehensive card index, it is placed in the appropriate envelope bearing the full address before passing to the messenger department, whence it is delivered by hand.

In the card index cabinet there are 65,000 cards each bearing full details concerning a particular telegraphic address. A unique feature of this system is that any card can be quickly located without any other card being disturbed. Many of the delivery envelopes bear addresses already printed; thus the whole process of decoding a telegraphic address and enveloping a message is a matter of a few seconds only.

One of the most interesting points about Radio House is the special provision made for express private delivery and collection where the traffic is consistently heavy. Apart from a number of telephone circuits available for the public, numerous private telegraph and telephone lines are rented by financial and commercial houses having traffic of a heavy and urgent character. Some of the telegraph circuits are operated with Teletype instruments by means of which messages are repro-

duced in typewritten characters at the other end of a telegraph line, as described some time ago in our pages.

From the moment a message is accepted, until its final handling, its passage through the office is timed at various stages by automatic electric time-stamps, controlled by a master clock.

The Ongar group of transmitting stations occupies an area of just over one square mile. The site is on high ground and in the centre is the power house, fig. 4, which furnishes all the electricity required for operating the transmitters and auxiliary apparatus.

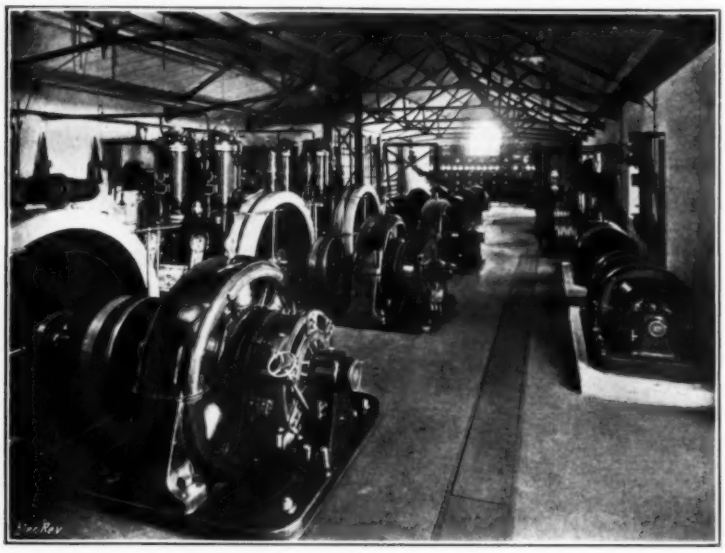


FIG. 4.—ONGAR POWER HOUSE.

At present there are three separate transmitting stations at Ongar: One (call signal, G L A; wave length, 2,400 metres) maintains a service with Switzerland and Spain; the second (call signal, G L B; wave length, 3,800 metres) communicates with France; and the third (call signal, G L O; wave length, 4,350 metres) serves Canada.

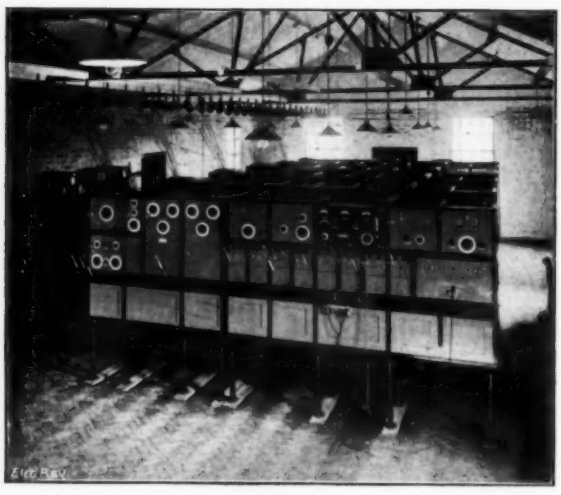


FIG. 5.—BRENTWOOD COMMERCIAL RECEIVERS.

The aerial systems closely resemble one another and consist, generally, of two circular cages with four wires suspended from two 300-ft. self-supporting lattice towers. The aerial is not connected directly to earth, but to an earth screen comprising a number of insulated wires supported on 30-ft. lattice masts. The provision of this metallic conducting screen between the aerial and earth reduces the losses in the soil under the aerial, and results in greatly-increased radiation efficiency and in stronger signals being produced at the receiving stations than would be the case with a buried "earth."

The legibility of signals under bad atmospheric conditions depends largely on the steadiness of the transmitted wave, and is attained at Ongar by the employment of the independent drive system. The fundamental principle of this system is the control of the main oscillations through the medium of a separate standard oscillation generator which, when once adjusted to the required wave length, maintains its adjustment with constancy.

The transmitting plant is actuated by high-speed signalling keys, which are themselves controlled direct from the London office as explained above. Fig. 2 is a view of the continuous-wave transmitter, showing from left to right (*a*) high-speed signalling relays, (*b*) the independent drive, and (*c*) the rectifier and oscillator valve panel. Fig. 3 shows the "A" station transmitting aerial and earth screen.

At the receiving station at Brentwood the circuits are so arranged that simultaneous reception can take place from four European and six transatlantic stations. Devices for filtering out "atmospherics" are in successful operation in connection with a new type of receiving apparatus which has been designed with a view to operation under adverse atmospheric conditions, special attention having been paid to the maintenance of adjustment with the minimum of attention. The receivers are very compactly constructed on a "unit" system, and advantage is taken of the Marconi-Bellini method of directional selectivity which makes it possible for the six transatlantic receivers, each tuned to a different transmitting station, to be operated simultaneously from the one aerial system illustrated in fig. 3. The new aerial that is used for receiving messages from the U.S.A. and Canada is supported by four 200-ft. towers, while the traffic from the Continental stations is received on a smaller aerial system, the towers of which are 96 ft. in height. Fig. 5 shows how compactly the new Marconi receivers can be installed, largely due to the method of screening employed; the six sets illustrated operate six distinct receiving circuits from one aerial, and they are used in connection with the American and Canadian services.

FIG. 6.—BRENTWOOD DIRECTIONAL RECEIVING CABINS.

On the left of fig. 6 are to be seen the screened cabins used for reception from the Continental stations at Paris, Berne, and Madrid, while on the right of the same view are the land line circuits connecting Brentwood, Radio House, and Ongar, of which there are seven

telegraph and seven telephone circuits all laid underground, and to them check circuits are connected in order to enable observations to be made of signals relayed to or from Radio House.

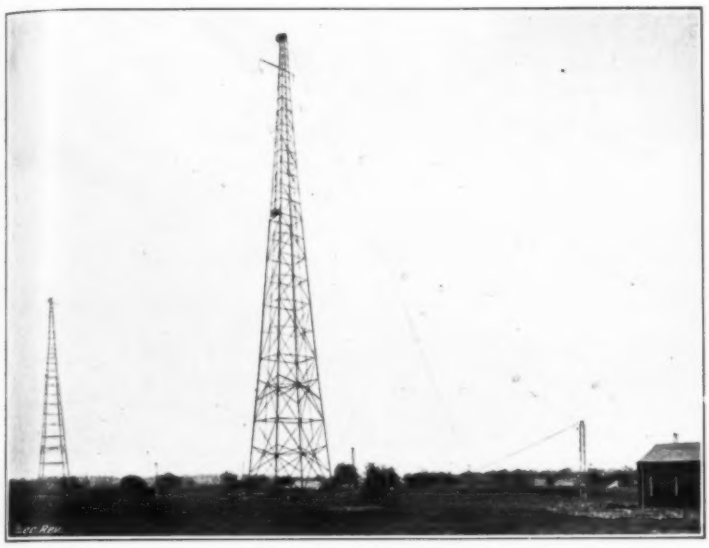


Fig. 7.—Ongar "A" Transmitting Aerial.

A feature that strikes the visitor is the apparent inactivity that prevails at the stations, for neither at the receiving nor the transmitting establishments do telegraphists need to be in attendance, owing to the automatic linking arrangements, and the duty of the attendant in charge of each set is merely to adjust and maintain it in such a condition that clear signals of maximum strength are passed to the lines for operating the recorders installed at the central control office in London.

Radio House may thus be termed the nerve centre of the Marconi high-speed commercial services, it being the control office for the whole system of communication by radio telegraphy at the English end, as well as a public receiving and distributing centre for traffic.

All the stations referred to above correspond with fixed stations abroad, but the company also conducts public services with Central and South America, Australia, New Zealand, the West Indies, British Guiana, British Honduras, &c.

The whole atmosphere of a radio-telegraph office now resembles that of a land line office, and radio services are able to compete with line telegraphs, not only from the point of view of lower cost per word, but also from that of rapidity of service.

ELECTRICITY SUPPLY AT EDINBURGH.

THE PORTOBELLO GENERATING STATION.

(*Concluded from page 62.*)

The opening of the new generating station at Portobello marks an important stage in the history of the undertaking, for it forms the principal source of supply for the Edinburgh and Lothians Electricity District, the first such district to be delimited in Scotland by the Electricity Commissioners.

The accompanying illustrations show the sea water pumping plant for supplying the condensers, the station switchboards and key diagram of connections, and a plan of the station. The high-pressure busbars are in duplicate, as also are the oil switches for the generators and the principal trunk feeders. Each set

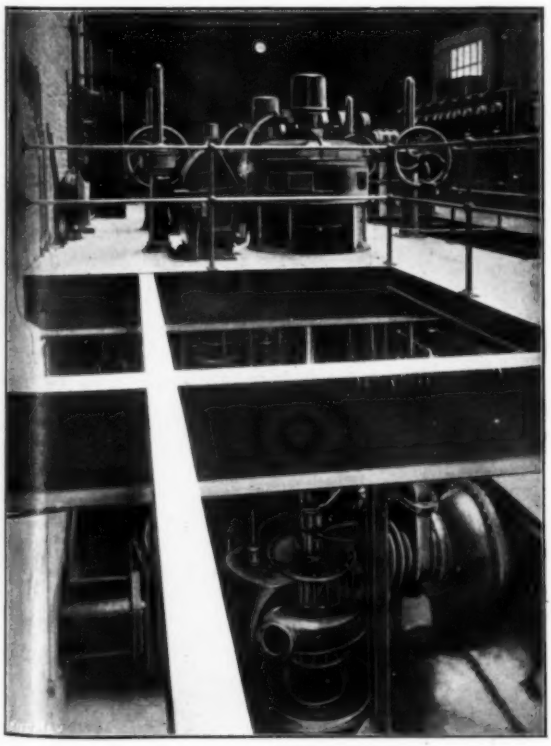


Fig. 8.—Electrically-driven Pumps.

Fig. 9.—Electrically-driven Valves.

of main bars is further sub-divided into four sections, three being used to supply the Dewar Place, Cowgate, and McDonald Road sub-stations respectively, and the fourth the Westbank local distributing centre located in the basement. One of the three trunk feeders, each of 5,000 kVA, feeding each sub-station, is equipped with duplicate switches and isolators that permit service to be obtained from either set of busbars, and the local centre is supplied through two 5,000-kVA equipments, the distribution being effected through 3-pole solenoid-operated oil switches of the O.F. pattern.

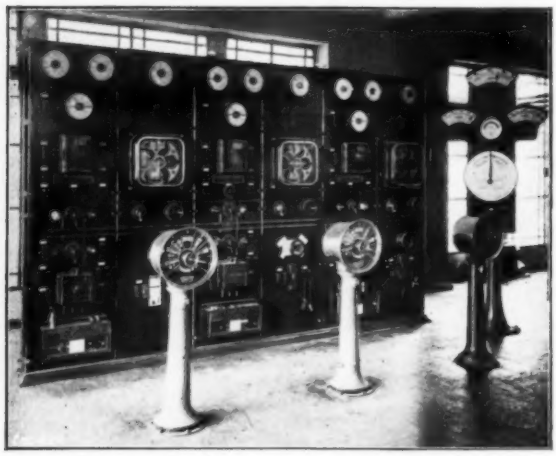


FIG. 10.—GENERATOR CONTROL PANELS.

Protection is afforded the generators by the usual arrangement of circulating-current transformers and relay and inverse time-limit overload devices, whilst over-voltage is guarded against by a special cut-out operating in connection with a B.B. voltage regulator and automatic field switch.

The feeders are protected by inverse time-limit overload relays and, in addition, a new form of protection to give selective switching on parallel feeders and interconnectors is being developed to the requirements of the consultants.

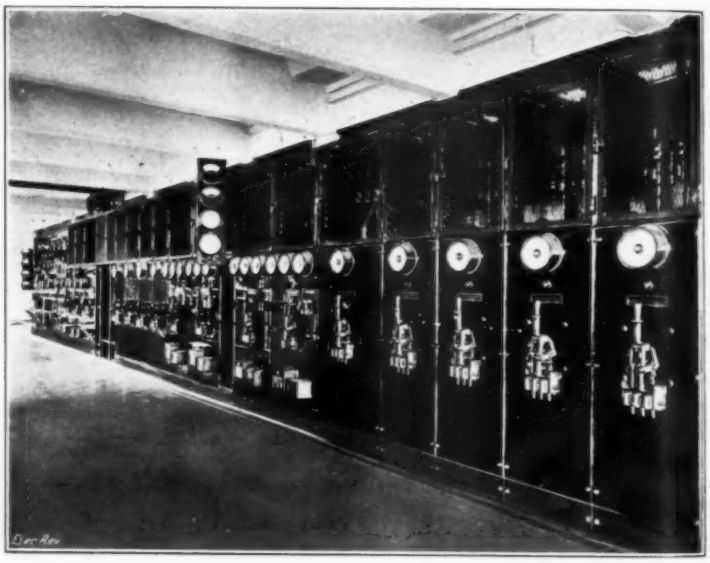


FIG. 12.—STATION SWITCHBOARD.

FIG. 11.—FEEDER AND TRAMWAY SWITCHBOARD.

The British Thomson-Houston Co., Ltd., has obtained the order for two feeder equipments of 6,600-volt switchgear to accommodate 10,000-kVA feeders to control the low-pressure side of the step-up transformers for the 33,000-volt supply to the outlying districts.

During the year 1922-23 the undertaking generated 55,167,519 kWh, of which 1,616,846 were sold in bulk; 1,277,378 were sold for public lighting; 13,643,915 for private lighting; 20,808,809 for power; and 7,783,650 for traction. As regards the last figure, in 1915-16 the Slateford tramway was then the only electric line in the city; in 1921-22 the Leith electric tramways were furnished with a supply, and the conversion of the city tramway system from cable to electric traction having now been completed, a considerable increase in the demand for traction purposes will accrue. In the year mentioned, the number of consumers was 24,895, who had the equivalent of 80,278 kW of lamps, motors, and other appliances connected. The undertaking had some 378 miles of mains and a revenue of £395,491, while the total amount of surplus that has been used to relieve the local rates is £67,619, in addition to a sum of £5,634 which has been applied to purposes connected with the improvement of the district. The total coal consumption at the existing stations during the year ended May 15th, 1922, was 68,950 tons, or an average of 3.62 lb. per kWh generated; it is estimated that the saving to be effected by the new station will result in the average fuel consumption being reduced to 1.8 lb. per kWh generated.

In conclusion, it must be recorded that Sir Alexander B. W. Kennedy, LL.D., F.R.S., &c., has been the chief technical adviser of the Corporation from the inception of the undertaking. He has been responsible for designing and carrying out the engineering work not only at the Dewar Place and McDonald Road stations, but also in connection with the new Westbank station and the sub-stations throughout the city.

Mr. D. T. Powell, M.I.E.E., to whom we are indebted for assistance in the preparation of this article, has been the resident engineer at Portobello on behalf of the consultants during the whole of the work.

Finally, we have to thank Mr. F. A. Newington, M.Inst.C.E., M.I.E.E., engineer and manager of the Edin-

burgh undertaking, for permitting us to visit and describe the station, and Mr. J. C. H. Balmain, photographer, for some of the photographs reproduced above, the remainder being our own.

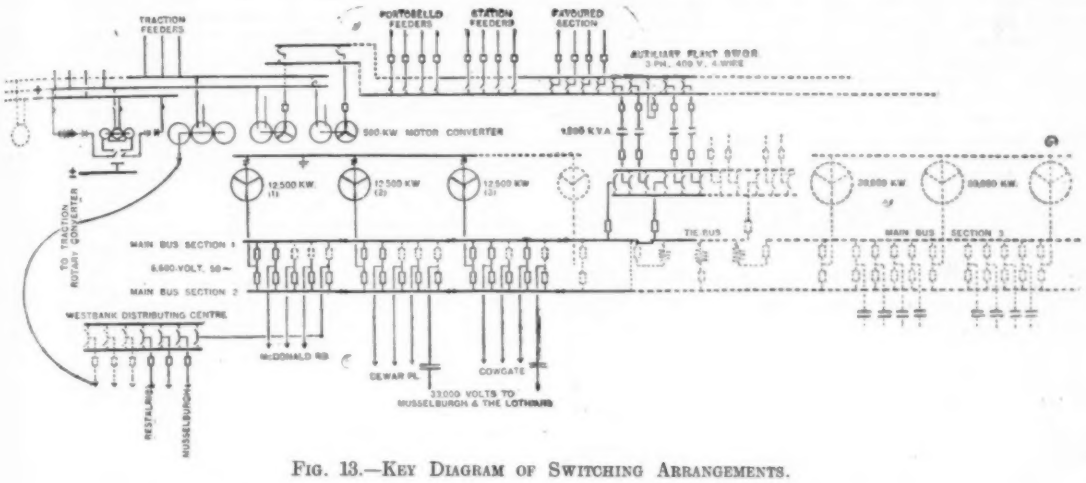


FIG. 13.—KEY DIAGRAM OF SWITCHING ARRANGEMENTS.

Opening Ceremony.

The stately building of the new super-station at Portobello stands by the side of the sea, and it was appropriate that it should be inaugurated by our sailor king. The royal cavalcade approached in bright sunshine, and included the King and Queen and the Duke and Duchess of York.

Lord Provost Sir Thomas Hutchison, after reading an

FIG. 14.—PLAN OF STATION.

address of welcome, presented a gold key, and requested His Majesty to formally open the station. King George expressed the pleasure with which he performed the ceremony, and the royal party was then conducted round the works.

The King also conversed with a number of ex-Service men who are connected with the undertaking. On leaving he was presented with a souvenir booklet by Councillor W. Bruce Lindsay, convener of the Electricity Committee.

To celebrate the royal opening a luncheon was given by the Corporation of Edinburgh in the City Chambers. Lord Provost Sir Thomas Hutchison presided.

Sir John Snell, in giving the toast of "The Corporation Electricity Undertaking," referred to its rapid development. Last year they were supplying energy at an average price of only 2.57d., and they were about to supply energy for lighting purposes at a reduced price of 4d., and for power and domestic purposes, at any rate, at the price of 1d. The wise administration of that undertaking had brought about the establishment of a reserve fund which, he was told, at the present moment, was not much less than £200,000.

Councillor Bruce Lindsay, who replied, thanked Sir John, and stated that the electricity generated in 1913-14 amounted to under 23,000,000 kWh; last year that figure was more than doubled. The revenue then was £142,000, and in the year just closed it was £418,000.

Bailie Couston, vice-convener of the Electricity Committee, presented to the Lord Provost and to Councillor Bruce Lindsay silver caskets as mementoes of the occasion.

The Development Commission.—The twelfth report of the Development Commissioners, for the year ended March 31st, 1922, refers to the electro-culture experiments carried out by the Imperial College of Science and Technology, and mentions Sir John Snell's testimony to the usefulness of the trials in the increasing of crops. He stated that the Electro-Culture Committee of the Ministry of Agriculture and Fisheries, of which he is chairman, had demonstrated the possibility of an increased yield of 22 per cent. in the case of spring-sown cereals as a result of electrification. The effect of an electrical discharge on other crops had yet to be determined. The period in the life of the plant when the current could be most economically applied, and the strength of the current to be used at different stages of growth, were not yet known with precision. It was also proposed to apply the discharge to root crops. Accordingly a grant of £1,540 was recommended by the Commissioners for the year. A report upon "Industries in Rural Districts," by Mr. E. C. Kny, appears as an appendix to the report. In this the favourable position of Germany, owing to the extensive distribution networks, is mentioned: ". . . even in isolated districts like Thuringia and the Giant Mountains one finds cottage workers operating in sheds or lean-to workrooms, small electric furnaces, drills, cutters, polishing machines, &c." The Hereford scheme is commended as "an excellent start." Referring to French rural industry, Mr. Kny shows that there are 23,450 electrically-driven cottage looms in the Loire and Haute Loire (St. Etienne) districts, where power is derived from the river Loire, and the Edison Electric Co. supplies motors (sale or hire).

Pulverised Coal.—As the result of tests the Puget Sound Power & Light Co., U.S.A., decided to equip ten boilers, having a total rating of 4,100 h.p., for use with powdered coal. More than 190,000 tons of this fuel has been burnt, with an average boiler efficiency of 80 per cent. The coal used is refuse which has accumulated at the company's mine during 20 years. This is washed at the mine, reducing the ash from 25 to 12 per cent. The operating cost of preparing the fuel is about 71 cents per ton.

NOTES.

(*Continued from page* 98.)

British Engineering Standards Association.—INDUSTRIAL STANDARDISATION.—A second unofficial conference of secretaries of the various standardising organisations now in existence has recently been held in Zurich, Switzerland. It was called by the secretary of the Swiss committee, with the cordial permission and support of his executive committee, and was opened by Mr. Hoenig, the president of the Swiss committee. The secretaries of the Standards Associations or Committees in the following countries were present: Austria, Belgium, Canada, Czecho-Slovakia, France, Germany, Great Britain, Holland, Italy, Norway, Sweden, Switzerland, and the United States.

The secretaries of the Japanese and the Russian standards committees were unable to attend. The first conference was held in London in April, 1921, and was attended by the secretaries of seven organisations. On this occasion 13 different countries were represented..

Mr. Zollinger, the secretary of the Swiss committee, was appointed chairman of the conference, and Mr. le Maistre, the secretary of the British Engineering Standards Association, was appointed vice-chairman. The secretaries of a number of organisations which have come into being since 1921 were present, and reports on the position in their countries with regard to standardisation were received with much interest. A general discussion took place with regard to the organisation and methods of working, the practical application of the standards and also the extent to which international collaboration is taking place at the present time and the possibilities of making it more effective.

At the meeting in London the Swiss secretary had been invited to act as a medium for general communication between the various secretaries, and appreciation was expressed of the excellent manner in which Mr. Zollinger had fulfilled this function.

The conference lasted from July 3rd until the evening of the 6th. The Swiss committee provided for the comfort as well as the entertainment of the secretaries, and in addition to giving a dinner and a luncheon, at which the members of the Swiss committee were present, it offered the secretaries a tour through the most superb mountain districts of Switzerland, ending with the ascent of the Jungfrau by the new electric railway. The arrangements made by the Swiss secretary were so excellent in every detail that this excursion added in no small degree to the harmony of the proceedings. The conference, being entirely unofficial, has no executive authority, and the recommendations made by the secretaries as a whole will be placed before the executives of the national organisations.

Electricity on Motor Ships.—Those who cast around for subjects of criticism of the motor ship can find more food for discussion in the case of auxiliary plant than of the propelling machinery, and the upkeep of the former is in some instances more strain on the ship's engineers than that of the main engines, says the *Motor Ship*, which points out that for generating plant, comparatively high speeds are demanded and the consequence is that the wear and tear may become a serious item, balanced against the prolonged good service of a reliable main engine. A very close association is to be found between speed and frequency of refits; if the practical marine engineer were allowed a free hand he would insist on a reduction in speed, and very likely the abolition of the trunk-piston engine. From the shipowner's point of view the case assumes a different aspect, considering that he has to foot the bill of initial costs. Running expenses would, presumably, be less for a cross-head engine than for a machine of the trunk-piston variety, but a low-speed cross-head engine for auxiliary work is, for the time being, a luxury which few can afford. Something in the nature of a compromise may be made, however.

The statement occasionally made that electrically operated auxiliaries on deck are unreliable lacks any foundation in fact. If there were any question of reliability, the first machinery to be replaced would be the steering mechanism, which is nearly always electrically or electro-hydraulically operated in Diesel-engined ships. Electric winches are extensively used, and electric practice is nearly always extended to the anchor windlass; but first and foremost it should be emphasised that, if reliance be placed in the use of electricity for steering, no opening can be found for opponents of electrical plant to gain a footing for argument against the adoption of the system.

A list of more than 50 large motor ships—most of them built fairly recently—shows several outstanding items: About four-fifths of the total favour electro-hydraulic steering gear, the remainder being fitted with electrical mechanism working without the interposition of a pump. Two tankers in the list are provided with steam pumps, steam winches, and other plant, but have electro-hydraulic steering gear, while others apply electric drive to the steering mechanism, although (apart from a small electrically-operated ballast pump) no other electrical plant is to be found outside the engine-room, in each case. This indicates that the owners, while preferring to employ steam plant for cargo pumps, winches, and the windlass, do not hesitate to install electrically-operated gear for steering purposes. It will be appreciated that the use of steam steering gear would necessitate a donkey-boiler being in operation during the whole of the voyage, whether it were required for other purposes or not; nevertheless, it is a favourable point on the side of the electric and electro-hydraulic steering gear advocates when they are enabled to demonstrate their case in this manner.

There would not seem to be any valid excuse for continuing the employment of steam-engines as auxiliary plant on the score of greater reliability. The steering gear of a ship is a piece of mechanism subjected to extremely hard service, and a breakdown may conceivably be infinitely more serious than in the case of a pump or winch. The legitimate conclusion to be drawn, then, is that, when it comes to a requirement of absolute reliability, electric or electro-hydraulic steering gear must displace steam plant.

Some time ago a well-known Swedish shipowner stated that he was converting the galleys on all his motor ships to electric power. It is, therefore, interesting to note that on the *Tantalus* electricity is used wholly for cooking purposes; this is the first Holt liner on which such an arrangement has been employed. The plant, which was built by Wilsons, of Liverpool, requires a maximum of 40 kW, but this demand is, of course, not maintained for a long period. It seems open to doubt whether electric cooking represents an economy over oil firing, but it is certainly cheaper than coal, at any rate on a motor ship. The regulation is very simple and one of the advantages is that, when the requisite temperature is reached, the maintenance of that temperature is a matter of extreme ease, whilst for cleanliness and comfort to the cooks it will be difficult to improve upon the electric galley. Throughout the whole of the accommodation, and in the seamen's quarters forward, heating is effected by electro-vapour radiators of the "high-low" type, which are so frequently adopted on motor ships. They seem to afford an ideal solution to the heating problem, avoiding the necessity for maintaining steam in the boiler and having certain advantages over the radiant type for cabin use.

Electric Ovens for Japanning.—An American dental company which uses electric ovens for japanning the metals parts of its apparatus, with a total rating of 280 kW at 230 V, 3-phase, reports that electricity was substituted for gas in order to ensure a high finish; the number of rejections due to imperfect baking has fallen from 20 per cent. with gas to less than 4 per cent. The cost of operation is about the same as with gas, but the temperature is automatically kept constant, and the baking time is less, resulting in increased output. Some of the ovens measure 7 ft. x 7 ft. x 7 ft., and can deal with two truckloads of material simultaneously.—*Electrical World.*

Educational.—FINSBURY TECHNICAL COLLEGE.—In our advertisement pages to-day the college authorities announce that the next entrance examination will be held on September 18th.

UNIVERSITY OF LONDON, UNIVERSITY COLLEGE.—Diplomas in electrical engineering have been obtained by Messrs. E. G. Brunker, J. E. T. Cogle, C. K. Irwin and J. Meek.

CITY AND GUILDS OF LONDON INSTITUTE.—The report of the Council for the year 1922 mentions that the distinction of Fellow of the Institute has been conferred upon Mr. W. R. Cooper, M.A., B.Sc., A.C.G.I., in recognition of his valuable contributions to the advancement of electrical engineering. The Delegacy of the City and Guilds (Engineering) College records its high appreciation of the long and efficient services of Professor T. Mather, F.R.S., who on his resignation was appointed Emeritus Professor; his successor in the Chair of Electrical Engineering is Prof. C. L. Fortescue, O.B.E. The report of the Dean of the College shows that 630 students were in attendance during the session 1921-22, compared with 609 in 1920-21 and 587 in the previous year; 129 entered for the final B.Sc. (engineering) examination, of whom 94 passed, 24 with honours.

A sum of £2,975 was agreed with the Office of Works as compensation for the use of the Goldsmiths' Company's Extension by the Admiralty. The expenditure of the Delegacy was £54,303; students' fees brought in £26,375.

The number of students attending Finsbury Technical College was 128, compared with 171 in 1920-21 (no first-year students having been admitted in that year, in view of the proposed closing of the college).

The Department of Technology reports that in 1922 examinations in Grade I of Electrical Installation Work were added to the list in England and Wales, at the request of the Electrical Contractors' Association, and within a fortnight 280 candidates entered for that grade: in all there were 317 candidates in this subject, of whom 79 passed. In Electrical Engineering there were 537 candidates, of whom 338 passed; and in Telegraphy and Telephony 1,847 entered and 1,260 passed. Only 12 entered for Electro-metallurgy, of whom 8 passed. There were 1,141 entries for the special examination in Magnetism and Electricity, with 731 successes.

L.C.C. GRANTS.—The London County Council Education Committee has decided that grants amounting to £72,633 shall be made to the University of London. The grants for the nine polytechnics will be £294,920.—*The Times.*

Appointments Vacant. — Telegraph foremen, for the Government of Nigeria (£440—£12—£500); switchboard attendant (£3 4s. 7½d.), for Newport (Mon.) electricity department. (See our advertisement pages to-day.)

This Week's Story.—Messrs. Johnson & Phillips inform us that though they are justly proud of their friendly relations with their customers, they seldom receive a letter couched in such affectionate terms as the one that follows:—

P. H. A——, Awianu Street,
Sea View House, Anamaboe,
June 14th, 1923.

To Johnson & Phillips, Ltd., Charlton, London S.E.7.

Dear Sir,

I am very glad to put this before you that I might have written you; but something disturb me in my ways; thus is why, I have keep long to write you; So, try your best imminent and send me your catalogue as early as possible; Do not fail to send it up. Because I cwant it very bad. I want to order something in it. I am on the way looking you per first mail. I have nothing to say more; only my thousand kisses to you.

I am Yours faithfully,
P. H. A——,
Awianu Street, Sea View House,
Anamaboe.

INSTITUTION NOTES.

Institution of Electrical Engineers.—ELECTION OF COUNCIL.—The result of the voting for new members of Council was as follows:—Elected: President: Dr. A. Russell, M.A., D.Sc. Vice-President: Sir James Devonshire, K.B.E. Hon. treasurer: Mr. P. D. Tuckett. Ordinary Members of Council: Members: Messrs. J. M. Donaldson, W. M. Thornton, D.Sc., Colonel T. F. Purves, G. W. Partridge, P. Rosling. Associate Member: Mr. S. W. Melsom.

NORTH-WESTERN CENTRE.—The Committee's report for the 1922-23 session shows that ten meetings have been held, the attendance varying from 140 present at three meetings, to a minimum of 70 at one meeting—being an average of 120 per meeting throughout the session, as against 115 last year. A new departure was the inviting of ladies to participate in a meeting, when the subject of "Electricity in the Home" was introduced by Mr. J. W. Beauchamp.

The informal meetings have again proved very attractive, the two subjects selected having evoked live discussions. The discussions have been well maintained; the number of speakers during the session has been 74, being an average of 7.4 per meeting. In this respect the Committee regrets to notice a falling away from last year's figures, which were 90 and 9 respectively.

The annual dinner was held on February 23rd, and was a thorough success, being attended by 153 members and guests, compared with about 120 last year. Another social function, successfully arranged, was the smoking concert, held on November 14th. The Committee has noted with pleasure the increasing support given to this Centre by the small-current or telegraphy members. By the development in other branches of the industry, which are closely allied with the electrical profession, such as railway and mining engineering, the Committee hopes to see similar increased support given to this Centre in the near future.

STUDENTS' SECTION.—The Students' Section of the N.W. Centre is now strongly established with a membership that is continually increasing; during the past year several meetings have been held as well as works visits, and two dances.

American Institute of Electrical Engineers.—ANNUAL CONVENTION.—The *Electrical World*, of July 7th, states that the annual convention of the A.I.E.E., which was held at Swampscott, Mass., broke the record with an attendance of more than 1,600, and was wholly successful. The meeting was opened with an address by the president, Mr. F. B. Jewett, on "Engineering Associations." Amongst the subjects that came under discussion were the use of a boiler pressure of 1,200 lb. per square inch for part of the plant in the new Weymouth station of the Boston Edison Co., artificial "lightning" discharges, a 12,000-volt d.c. generator, and transatlantic radio-communication.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Mr. E. W. PETTER, the newly-elected president of the British Engineers' Association, is chairman of Petters, Ltd., Yeovil, and managing director of Vickers-Petters, Ipswich. He is a West of England man, and it is interesting to know that in 1894/5 he was experimenting with his brother on motor cars. They produced, in 1895, one of the first motor-cars made in this country. The development of the internal combustion engine was, however, in those days a more profitable field of operation than motor-cars, and Mr. Petter, therefore, became associated with that line of development in manufacturing engineering. He is a recognised authority on everything appertaining to the theory, construction, and practice of internal combustion engines. In politics a Conservative, he contested, though unsuccessfully, North Bristol, as an Independent Conservative in 1918. Mr. Petter has always taken a special interest in industrial affairs and in the questions at issue between employer and employed, and has written largely on the subject. He is on the Executive Committee of the

MR. E. W. PETTER,
THE NEW PRESIDENT OF THE BRITISH ENGINEERS' ASSOCIATION, INC.

Industrial League and Council. As president of the British Engineers' Association, which is organising the engineering section of the British Empire Exhibition, and which, moreover, is expected to play an important part in the forthcoming Economic Conference with the Dominions, Mr. Petter will have a very busy period of office. He is a descendant from one of the old Huguenot families.

Mr. GEO. V. TWISS, M.I.E.E., who founded the Twiss Electric Transmission, Ltd., and has acted as managing director since its inception, has now retired from that position, retaining, however, his financial and other interests in the company and his seat on the board, and has become advisory director. Mr. Twiss has taken separate offices at Broad Sanctuary Chambers, 11, Tothill Street, S.W.1, for the purpose of attending to this and to private work.

The first meeting of the newly-elected District Industrial Council for the Electricity Supply Industry, No. 5 (West Midlands) Area, was held at Birmingham on July 13th. Mr. R. A. CHATTOCK (Birmingham) was re-elected chairman for the fourth year in succession, Mr. Alderman J. GREGORY was re-elected vice-chairman, and Mr. E. J. JENNINGS (Birmingham) was re-appointed secretary and treasurer.

Mr. J. E. EDGECOMBE, M.I.M.E., M.I.E.E., formerly borough electrical engineer, Kingston-on-Thames, who lately resigned the appointment of director of the Electric Lamp Manufacturers' Association, Great Britain, Ltd., has joined the board of the Stearn Electric Lamp Co., Ltd., of 12, Grosvenor Gardens, S.W.1.

According to Press reports Dr. FELIX DEUTSCH, of the A.E.G., has lately been in London on a business visit.

Obituary.—MR. R. T. TURNBULL.—We regret to learn that Mr. Robert T. Turnbull, of Wellington, a director of the well-known New Zealand electrical engineering company, Turnbull and Jones, Ltd., was killed in a motor collision on the Hutt Road on Thursday evening last week. Mr. Turnbull, who was 58 years of age, went out from this country many years ago, and he has been long and prominently identified with electrical affairs in New Zealand.

NEW COMPANIES REGISTERED.

R. Egerton-Green, Ltd. (191,164).—Private company. Registered July 6th. Capital, £1,000 in 900 7½ per cent. cumulative preference shares of £1 each and 2,000 ordinary shares of 1s. each. To acquire the business of manufacturing electrical engineers now carried on at 22, Dyott Street, New Oxford Street, W., as "R. Egerton-Green & Co.," and to carry on the business of electrical engineers, mechanical engineers, iron-founders, and manufacturers of all kinds of electrical and wireless instruments and appliances, &c. The subscribers (each with one ordinary share) are:—R. E. Eastty, 77, Napier Road, Tottenham, N.15, clerk; W. Wood, 5, Thavies Inn, E.C.1, clerk. The subscribers are to appoint the first directors. No qualification necessary. Remuneration as fixed by the company. Secretary (*pro tem.*): R. S. Eastty. Registered office: 22, Dyott Street, New Oxford Street, W.C.1.

Cambrian Electricity Supply Corporation, Ltd. (191,241).—Registered July 11th. Capital, £10,000 in 9,500 8 per cent. cumulative preference shares of £1 and 10,000 founders' shares of 1s. each. To acquire the water-power station or factory and water rights at Dolgelly, and to supply electric light and power in all its branches. Minimum cash subscription, 100 shares. The first directors are: W. Thompson, 43, Cannon Street, E.C.4; W. Burton, 60, Castle Street, W.C.2; A. M. Eaton, 7, St. Swithin's Road, Bournemouth. The North Wales Power Co., Ltd., shall be entitled, at its option, to nominate one director. Qualification, 25 shares. Remuneration, £100 each per annum (chairman £150). Secretary (*pro tem.*): W. Burton. Registered office: 43, Cannon Street, E.C.4.

Meldons, Ltd.—Private company. Registered in Dublin, July 5th. Capital, £6,000 in £1 shares. To acquire the business carried on at 28, South Anne Street, Dublin, as "James C. Meldon," and to carry on business as electrical engineers and contractors. The first directors are:—J. C. Meldon, 28, South Anne Street, Dublin, electrical engineer; L. D. Wainwright, 28, South Anne Street, Dublin, electrical engineer. Secretary: L. D. Wainwright. Registered office: 28, South Anne Street, Dublin.

Roderick Electric Supplies Co., Ltd. (191,200).—Private company. Registered July 9th. Capital, £2,500 in 2,450 7 per cent. non-cumulative preferred ordinary shares of £1 each and 1,000 deferred shares of 1s. each. To carry on the business of manufacturers, importers, and exporters of, and dealers in electric lighting, cooking, heating, and all kinds of electrical apparatus, conduits, dynamo machines, electric accumulators, motors, batteries, &c. The subscribers (each with one preferred ordinary share) are:—W. A. Roderick, 109, Guilford Street, W.C.1, electrical engineer; Miss E. Roderick, 109, Guilford Street, W.C.1, book-keeper. The first directors are to be appointed by the subscribers. Secretary: Miss E. Roderick, 109, Guilford Street, W.C.1.

Tredegars (1923), Ltd. (191,236).—Private company. Registered July 10th. Capital, £20,000 in £1 shares. To carry on the business of electrical engineers and contractors, general manufacturers and suppliers of electricity, electrical fittings, and electrical work for domestic purposes, manufacturers and repairers of telegraph, telephone, wireless and sound instruments, &c., and to adopt an agreement with Tredegars, Ltd. (in liquidation), and N. Bell and B. B. McCallum (its liquidators) and H. J. Upton. The first directors are:—J. P. Dillon, "Conlea," Dundrum, Co. Dublin; A. N. A. Vanneck, 1, Hertford Street, Mayfair, W.1; W. A. M. Gibson, Theberton House, Leiston, Suffolk. Qualification, 25 shares. Registered office: 7, Brook Street, Westminster, S.W.

Wortex Manufacturing Co., Ltd. (191,238).—Private company. Registered July 10th. Capital, £2,000 in £1 shares. To acquire the business of a manufacturer, importer, and exporter carried on by Eugene Szekely as "The Wortex Manufacturing and Trading Co.," and to carry on the business of manufacturers, importers, and exporters of and wholesale and retail dealers in electrical apparatus, glassware, textile fabrics, jewellery, plated goods, hardware, perfumery, leather goods, ornaments, stationery, and fancy goods, &c. The first directors are:—E. Szekely (chairman), 62, Oxford Street, W.1; K. S. Lowe, 138, Wardour Street, W.1. The said E. Szekely shall be sole managing director and shall be permanent, subject to holding 500 ordinary shares. Qualification of first directors, 1 share; of subsequent directors, 250 shares. Remuneration of managing director, £500 per annum. Registered office: 62, Oxford Street, W.1.

Carter & Mitchell, Ltd. (191,189).—Private company. Registered July 9th. Capital, £2,000 in £1 shares. To carry on the business of electricians, electrical and mechanical engineers, manufacturers of, and dealers in electrical wires, cables, and flexible cords for lighting, heating, power, telephone and wireless work, automobiles and all kinds of gas lighting appliances, &c. The first directors are:—T. Carter, 155, Etchingham Park Road, Church End, Finchley, N., manufacturer's agent; W. L. Mitchell, 94, Little Horton Lane, Bradford, electrical engineer. Qualification, £100. Secretary: T. Carter. Registered office: 24, Alsop Street, Upper Baker Street, N.W.1.

A. Deakin & Co., Ltd. (191,187).—Private company. Registered July 9th. Capital, £1,000 in £1 shares (400 6½ per cent. cumulative preference and 600 ordinary). To take over the business of an electrical and heating and ventilating engineer, contractor and supply dealer carried on by A. Deakin at the Victoria Ironworks, York and elsewhere. The first directors are:—A. Deakin, 5, St. John Street, York, electrical engineer; T. Parker, 12, Somerset Place, Sale, builder; Mrs. E. Matthews, 216, Eflor Street, Pendleton. Qualification, £1. Registered office: Victoria Ironworks, Walmgate, York.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Midland Wireless Manufacturing and Supply Co., Ltd.—Particulars filed of £500 debentures authorised June 12th, 1923, charged on the company's undertaking and property, including uncalled capital, the whole amount being now issued.

Friend, Wintle & Co., Ltd.—Debenture dated June 29th, 1923, to secure £4,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Branch Nominees, Ltd., 15, Bishopsgate, E.C.

Coates & Co. (Sheffield), Ltd.—Particulars filed of £10,000 debentures authorised June 29th, 1923, charged on the company's undertaking and property, present and future, including uncalled capital (if any), subject to £6,500 first debentures, the amount of the present issue being £2,450.

Torpoint Electric Supply Co., Ltd.—Satisfaction in full on June 11th, 1923, of debenture dated February 5th, 1917, securing £1,280.

East Anglian Electricity, Ltd.—Satisfaction to the extent of £2,000 on June 18th, 1923, of debenture dated November 30th, 1922, securing £3,000.

Neon Lights, Ltd. (Old Company).—Satisfaction in full on June 28th, 1923, of debentures dated January 26th, 1923, securing £2,000.

Smithfield Markets Electric Supply Co., Ltd. (53,354).—Return dated March 15th, 1923. Capital, £100,000 in £5 shares. 12,000 shares taken up. £60,000 paid. Mortgages and charges, £22,470. Resolution confirmed on June 22nd, 1923, that each of the 12,000 shares of £5 each be divided into five shares of £1 each.

CITY NOTES.

General Electric Co., Ltd.

The annual general meeting was held on July 12th at Magnet House, Kingsway. Mr. Hugo Hirst, who presided, said that the phrase, "The year under review has presented special difficulties," had become general, not only to them, but to most industrial concerns. The difficulties, however, whilst continuing and having the same depressing effect on the results of the year, seemed to be of a different nature every time. If the opinion of the Press expressed on their report was indicative of the feelings of their shareholders, the management of the company had every reason to be pleased with the year's results. They were more than pleased, bearing in mind the unsatisfactory conditions prevailing during the first four or five months of the year, about which he made a full and frank confession at the last meeting. But considering their determined efforts, they were entitled to hope for more. He thought the time was drawing near when those results would again be theirs—the present balance-sheet threw out great hopes in that direction. The profit from trading account—£637,224—exceeded that of the previous year by £167,670, an increase of about 33¼ per cent. Remembering the absolute paralysis of trade during the first quarter of the year, and seeing that they had already done so much better this year during the same period, it was reasonable to hope that a further advance might be made in this figure, subject to a proviso on which he would dwell later. Income from investments at £113,273 was practically the same as previously. Those two items, added to the carry forward, gave them a total of about £968,000 instead of £914,000 available, yet those better results were not yet sufficient, as they had increased charges to meet. There was first required an additional £61,744 to meet debenture stock interest, as in this year a full year's interest was due, as against only eight months' interest in the previous year. Depreciation absorbed £20,000 more. The item of £182,000 for depreciation should be a convincing proof to them that, in spite of lean times, the board was not changing the conservatism with which it treated the company's asset values. Those heavy depreciations were desirable both in the interests of cheap production and for the safety of the company's future, which weighed much more heavily with them than immediate results. There was also a slightly higher charge of about £15,000 for preference share dividend. Contribution to Pension Fund was slightly less. By the declaration of a 5 per cent. dividend on the ordinary shares, the carry forward was reduced by £40,000, and he hoped and believed they might be able to add to that item next year, rather than deduct. In making that statement, he hoped he would not be accused of too much optimism. He did not anticipate a boom; he did not anticipate bursting prosperity immediately, but those who honoured him by listening to his addresses from that chair would admit that his prognostications had been so far fairly correct. He was frank and outspoken when he saw troubled waters in front of them. He was equally frank to-day when he believed they were sailing into calmer waters, though there might be some nasty squalls before they got there. Referring to the balance-sheet, the £100,000 increase in creditors need not cause any anxiety—it was mainly due to cash deposits with them of allied and subsidiary concerns. On the credit side there was a slight increase of freehold land and building and fixed plant and machinery, which was due to the completion of the programme which had been put before them. It was not anticipated that those items would now materially change for some time to come. Sundry debtors were less by £200,000. That did not indicate smaller business, but smaller values. He estimated that there had been an all-round drop in prices of at least 20 per cent., and, in order to do the same amount of business, a greater volume of work had passed through their factories and selling organisations. He quoted one interesting example: In one branch of their supply business they had sent out during the year 314,000 invoices of an average value of £4, compared with 255,000 invoices in the previous year with an average value of £4 18s. 6d. This same picture was reflected in their country and overseas branches, and to have done this with a much reduced staff spoke highly of the loyalty and the ability of their employés, who had accepted in a fine spirit a reduction in remuneration and, realising the prevailing conditions, applied throughout their best pre-war mentality. This factor of reduced values naturally affected the other items—"Stock-in-trade" and "Work in progress"—and, to some extent, accounted for the increase in their liquid cash resources which, apart from the proceeds of the preference issue, had risen by some £500,000. There were two items which he would like to see disappear one day from the balance-sheet—premium on purchase of Fraser & Chalmers, and expenses of issue of debenture stock. The items were too big to be treated with small allocations: they were both of a comparatively recent date, and would be dealt with in due course. In the meanwhile, they must content themselves with the feeling that they had against them the £707,000 reserve fund. But there were other reserves. He referred particularly to the items, loose

plant, tools, &c., fixtures and installations, goodwill and patents, which figured at £1. It had cost them about £1,000 per week to keep those first two items at the nominal amount of £1. The very considerable amount spent on them could be judged by a study of their depreciation accounts and generous allocation from revenue, but the item of goodwill, which also stood at £1 in the case of their company, was not, and could not, be calculated in figures. Goodwill generally represented the difference between the assets of a company and the capitalised earning capacity: it was a big amount in good years, but, on that principle, it dwindled into nothing in unsatisfactory years. When a company like theirs had made up its mind to a programme such as they had year after year put before the shareholders, if it desired to be independent and hold its own against its great competitors in other parts of the world, it had to develop assets of a different kind, which could not be expressed in £ s. d. at present. They took yearly a very considerable amount out of revenue, but the full results could only come in the future. He referred to the intensive culture and improvement of the human element in their organisation. A great manufacturing concern like theirs could not submit to the accidents of rule-of-thumb methods. They had to implant into their staff not only the ordinary knowledge of business and manufacturing experience, but they had to go much deeper. They had to get hold of the knowledge of the principles underlying their specific processes, and the precise way in which they must be applied in manufacturing. Those required continuous study and discovery, and, for that reason, they had committed themselves to the establishment of an important research laboratory, the formal opening of which by Lord Robert Cecil and Sir J. J. Thomson took place in the early spring. They started it mainly for the purpose of the better understanding and production of their own materials, for the improvement in the manufacture of their goods, and for the education of their staff. The study of these things had been too long relegated to Universities or, as the war taught them, to foreigners, and they were convinced, not only by faith, but from experience already obtained, that the development and the sure foundation of manufacture came to those who studied those laws and applied them to their own industry. Mr. Hirst proceeded to give a few examples, such as the vacuum of lamps and wireless valves, tungsten filaments, machinery insulation, dry cells, glass, and telephone circuits. There was another direction in which they were sowing seeds. They could not apply electricity to railways, mines, rolling mills, the textile industry, or, say, for the propulsion of ships, without having by their side electrical experts, men of experience in those particular industries. They were acquiring such men or training them, as the case might be, in order to take full advantage of that business when reconstruction of the world really started. For the purpose of testing the numerous applications of electricity for different industries, they had, apart from research, put by the side of their factories, development departments, which were also a considerable expense, but the results of which could not fail to come in due course. It was due to those institutions which they had started, and the strenuous efforts and skill of their designers and engineers, that, in spite of the short time since they entered the field of heavy engineering, they could now claim that they occupied a premier position, not only in the manufacture of lamps and other supply articles, but also of the largest plant, be it turbo-generators, compressors, turbo-blowers, gas-cleaning, conveying, or mining plant. Since March the number of their employés had increased from 15,000 to 15,814, and they had the factories to employ double the number as and when sufficient business offered itself. Mr. Hirst referred to the visit of the Prince of Wales to the Witton works. It was their workpeople, and not the works, that he went to see, but His Royal Highness was so delighted with all that he saw, that he promised to pay a visit to see the works themselves at the first opportunity. With such preparations for the future, great success and prosperity should be assured to them. He would have no hesitation in prophesying that as a certainty, were there not a heavy cloud hanging over them at the present moment, which might thwart their best and most earnest endeavours. That cloud had already, during the last few months, checked the slow and steady progress in the recovery of the world that seemed visible during the past winter and early spring. He referred, of course, to the question of the Ruhr. A meeting such as that was not the place for politics, nor was it his intention to enter that sphere, but when their statesmen grappled with difficulties which were of an economic nature, which affected the very foundations of trade and industry and their greatest ailment, unemployment, they could only be helpful to the Government by each in his sphere raising his voice and frankly stating how he was affected by it. The vast majority of the British people sympathised with their ally, France; they felt with France that she, like ourselves, was entitled to the fullest reparation, and we both felt that our joint will must be imposed on our ex-enemies. But, after four months of occupation, surely it could not be wrong to draw conclusions whether the steps which our ally had taken would fulfil their object. He could not but feel that the steps taken by France were not giving her what she had a right to expect, and, by her stranglehold over Germany, she unwittingly strangled us, her other allies, and more or less the whole world. He knew there were some of them who, through this action of France, had momentarily benefited. Even the electrical industry might have secured a few chance orders, or orders at better prices through the present impotence of Germany. But the action of France—and he was stating only facts—had nearly destroyed the purchasing power of Germany, and, through it, of Central Europe. The collapse of the mark was the cause of growing unemployment in Lancashire and Yorkshire; would it not be better for them to have a prosperous Lancashire and Yorkshire? The collapse of the mark was the cause of India, China, Australia, Argentine, and Brazil having lost a great share of their market for their raw materials, and, owing to that, they were further impoverished and unable to place those orders with us for which we were waiting and which we required to keep our population alive. But more than that, even the very reparations in kind which France had exacted, if they were not absorbed by France, if they were thrown on the markets of the world, further harmed our industries. Goods delivered on terms imposed, or goods confiscated, if thrown on the markets of the world without considering the cost of production by other nations, would damage all industries affected, and create further unemployment. Almost every country had been waiting now for some years to start reconstruction. The money for this purpose was not available, there was not enough money in the world; but one thing, and one thing only, would enable them to go ahead, namely, credit; but credit could only be created in times of confidence and peace. Until this Ruhr question was settled, there lurked in the minds of everybody the possibility of danger, and the uncertainty of the immediate future, and the credit in the world was dwindling instead of increasing. He hoped the wisdom and prudence of our statesmen, and those of France, would be able to secure us, at an early date, that peace for which we were longing and which the world needed. They could not defer action much longer. Without it all their aims, all their work, and all their ideals might be jeopardised by a crisis graver than any of them had ever witnessed, and he was afraid time was short; they had already begun to drift in that direction. But for that dark cloud, his optimism with regard to the future of the company and of the country would have been as of old—bright, definite, and undiluted.—Mr. E. G. Byng seconded the motion, which was carried unanimously.

Edmundson's Electricity Corporation, Ltd.

The annual meeting was held on July 11th, Mr. P. D. Tuckett presiding. Proposing the adoption of the report, the chairman said it was a pleasure to be able to submit a most encouraging report of the company's progress, and he was sure it must be a great satisfaction to the shareholders. The difficulties of the war and post-war period had been overcome, and they looked forward to the future with assured confidence. The net profit of £52,103 was larger by £20,000. The three items of gross trading profits, dividends and interest on investments and advances, and profit on working local authority and other undertakings, all showed most gratifying and substantial increases, whilst fixed charges were reduced by £6,000 as the result of the repayment of the three-year notes and the cancellation of the prior lien debenture stock. With the balance of £15,512 brought forward they had a total profit of £67,615, out of which they had already paid interim dividends of 3 per cent. on the cumulative and non-cumulative preference shares, and they now recommended that the balance be applied in paying a final dividend of 4 per cent. on both classes of preference shares, making 7 per cent. for the year, and a 7 per cent. dividend for the year on the ordinary shares, carrying forward the balance of £22,815. Under the arrangement come to 11 years ago, the cumulative and non-cumulative preference shareholders were entitled to have their rate of dividend raised from 6 per cent. to 7 per cent. whenever a dividend of 4 per cent. or more was paid on the ordinary shares, whilst the non-cumulative preference shares would be consolidated with the cumulative preference shares as soon as the full 6 per cent. dividend had been paid on them in two consecutive years. They saw no reason to doubt their ability to maintain the 7 per cent. ordinary dividend, from which it followed that both classes of preference shareholders might expect to continue to receive a 7 per cent. dividend, whilst the non-cumulative preference shareholders could look forward to their shares ranking *pari passu* with the cumulative preference shares a year hence. The improved results were due in part to a larger output, but mainly to the fall in costs. In spite, however, of that welcome reduction in costs, they were still more than double the comparable figure for 1914, with no immediate prospect of any substantial further reduction. With the exception of Alderley Edge and three of the Isle of Wight undertakings, for which they were still awaiting new Orders under the Act of last year, all their undertakings were now freed from the hampering restrictions imposed by the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, and this had enabled several of them to pay increased dividends. The exemption from corporation profits tax originally granted to public utility undertakings was last year extended for a further period of three years—until December, 1925—by which time he hoped that admittedly most undesirable tax would have disappeared. The marked improvement shown in the company's financial position a year ago had been still further extended. The note issue item had disappeared,

the reserves were increased by £22,000, and liquid resources by £21,000, and they had now obtained a clean certificate from the auditors. In the table of investments and advances there was an increase of £26,000 in share holdings, an increase of £32,000 in debenture holdings, and a reduction of £70,000 in advances. Those changes reflected the strengthened position of the sub-companies. They had taken an interest in the Whitchurch and Pangbourne and Tisbury undertakings, and had acquired the undertaking at Southwold in Suffolk, and three other new undertakings appeared in the table—Crieff, Elgin, and Yeovil. Excluding the Lancashire Power Co., their additional connections amounted to 3,688 kW, a somewhat smaller addition than in the previous year, but trade depression militated against power connections, and consequently a much larger proportion of their connections were for lighting. Those increased lighting connections and the sale of over 1,000,000 additional kWh for lighting afforded no indication that the higher rates of charge, which their enhanced costs necessarily entailed, were commercially unsound, and restricted the development of the business. It was of vital importance in the interests of their consumers no less than in their own that the improved financial stability of their small undertakings should be maintained. Subject to that paramount consideration, it was their intention to reduce prices whenever circumstances warranted it, and they had already done so in a number of instances, but the surest means of bringing about lasting reductions in price was to secure permanent reductions in cost by attracting fresh capital for the active development of the business which was only possible if they could demonstrate their ability to earn an adequate return. Taking the business as a whole, they had no anxieties as to the future, provided they were free to conduct it on commercial principles. There was still ample scope for development, and all the tendencies were in favour of the extended use of electricity.—Mr. Stanley Beeton seconded the motion.—Replying to a shareholder, he said that, without absolutely committing himself, he thought it was probable that when they paid the half-yearly dividend on the preference shares next January, they would also make an interim distribution on the ordinary shares too.—The report was adopted.

Launceston and District Electric Supply Co., Ltd.

At the annual meeting held on July 9th, it was reported that the receipts for 1922 were £3,521 (against £3,045), and the working expenses £1,819 (against £1,497); gross profit £1,702. After meeting bank charges, and debenture and preference interest, the net profit was £1,328 plus £527 brought forward. The company is only authorised to pay a dividend of three quarters of the pre-war rate of dividend on the ordinary capital, but as it would only be 15/16 per cent., and would amount to £60 altogether, it has been decided to hold that amount in reserve to add to any future dividend that the company may be able to pay. £350 to depreciation, £300 to reserve, paying off 20 debentures (£500), carrying forward £704. The report stated:—The sawdust plant is giving satisfaction, but the old anthracite gas plants are needing considerable repairs in order to make them at all workable, and as the plant (during some of the winter months) has had to be working at its maximum load, they feel they must make some provision during the summer in order to meet the demands that will be made again during next winter. They have carefully considered the matter and have decided to erect another gas producer as quickly as possible. Lamps now connected are 15,357, an increase of 1,583. Motors connected number 32, with a total of 183 h.p.

Brisbane Electric Tramways Investment Co., Ltd.

Mr. H. R. Beeton (chairman), presiding at the annual meeting on July 10th, said that the accounts dealt with the closing period of the company's operation of the Brisbane tramways. The receipts of the Brisbane Tramways Co. were £601,993, and the total expenditure £492,954, leaving a net profit of £109,929. With £15,812 brought forward, there was a sum of £125,752 available. Of this amount the payment of dividend absorbed £100,000, and the balance was carried forward. The revenue account of the investment company showed an available balance of £134,383, and after providing for debenture interest, preference dividend, &c., the payment of 8 per cent., free of tax, on the ordinary shares was recommended. A balance of £39,325 was carried forward.

The speaker then reviewed the history of the Brisbane Tramways Co. since its inception in 1895 when it took over an inefficient system troubled by excessive omnibus competition. The policy of electrification was soon justified, and the company had been able to pay a dividend of 8 per cent., free of tax, on its ordinary shares every year since 1909. They claimed to have provided Brisbane with one of the most efficient tramway systems in the world. The Trust constituted by the Brisbane Tramways Trust Act of 1922 entered into possession of the undertaking on January 1st. No agreement had been arrived at as to the amount to be paid as purchase money; proceedings were pending before the full Court of Queensland to determine the basis or principle upon which the amount should be assessed. The company claimed that the price should be the value of the entire undertaking as a going concern, but the Government wished to pay such a sum as would represent the cost of construction of a similar system on January 1st, 1923, after making deductions for depreciation, and excluding so-called "unauthorised" tramways laid down at the request of local authorities or with their acquiescence. Pending the final settlement of the amount of purchase money, interest at the rate of 5½ per cent. per annum was accruing on the finally-determined amount. £50,000 had been received on account, but there was no assurance as to future payments, and in the circumstances it might be impossible to continue the payment of the usual dividends. This would not ultimately be a loss to the shareholders, however, as any deficiency would be made up when the purchase money was received. Payment of the purchase money was to be made within two calendar months after its final determination, either in cash or at the option of the Government at the expiration of 21 years from January 1st, 1923, interest being payable in the meantime at 5½ per cent., and in the latter alternative the company might call upon the Trust to issue 5½ per cent. debentures having a currency of 21 years of a total face value equal to the amount of the purchase money. All payments which were nominally to be made by the Trust were guaranteed by the Queensland Government.

Cordoba Light, Power, and Traction Co., Ltd.

The annual meeting of this company, whose report and accounts were reviewed in our last issue, was held on July 16th. Sir George A. Touche, Bart., who presided, referred to the improved position, but said that certain extensions of the company's system had been delayed on account of threatened intervention by the Federal authorities in the negotiations being carried on with the Cordoba authorities. The plant for the improvement of the steam power station was in course of erection and plant had been ordered for the reconstruction of the hydro-electric station. With the acquisition of the undertaking of the Argentine Power and Tramways Co., Ltd., for which the approval of share and debenture holders was sought, the company would take over the control of some £62,000 in cash and British Government securities.

The report and accounts were adopted, and subsequently the acquisition of the Argentine Power and Tramways Co.'s undertaking was approved, as were also proposals for increasing the capital to effect this, and for changing the title of the company to "The Argentine Light and Power Co., Ltd."

Hong Kong Tramway Co.

We read in the *Financial Times* that at extraordinary meetings of this company to be held in October, resolutions will be proposed that the company be wound up voluntarily and authorising the liquidator to distribute the assets consisting of all the shares of the Hong Kong Tramways, Ltd. (incorporated in Hong Kong), shareholders to receive a certificate for the same number of shares in the Hong-Kong Co. as they now hold in this company. The directors are of opinion that the winding-up of the company will not adversely affect the position of shareholders, but will be an advantage to them, as it will eliminate London expenses, will abolish differences in exchange, and entirely remove the possibility of future liability to Imperial taxation. Shareholders in Great Britain will, of course, be liable as before to pay income tax on their dividends.

Eastern Telegraph Co., Ltd.

The revenue during 1922 was £3,489,071, from which are deducted £1,653,838 for the ordinary expenses and £540,256 for expenditure relating to maintenance of cables, income taxes payable abroad, and special payments and temporary allowances to staff, leaving a balance of £1,294,976. After providing for income and corporation profits taxes and final adjustment of excess profits duty payable in England, interest on loan from the Eastern and South African Telegraph Co., Ltd., interest on mortgage debenture stock, and dividends on the preference stock, which in all absorb £447,728, there remains £847,249, plus £568,008 brought forward. £400,000 has been placed to general reserve fund. Total distribution of 10 per cent., free of income tax, on the ordinary stock; balance, £515,257, carried forward.

Marconi International Marine Communication Co., Ltd.

Mr. Godfrey C. Isaacs (deputy-chairman) presided at the annual meeting on July 13th. In presenting the report and accounts (*vide* ELEC. REV., July 13th, p. 68), he said that Senatore Marconi was unable to be present owing to his pre-occupation with further tests in connection with important new developments. Turning to the accounts, Mr. Isaacs said that in view of the continued depression in the shipping industry the results were very satisfactory. The 5½ per cent. mortgage debentures had been reduced from 2,964 to 2,901 by advantageous purchase. The amount representing plant, apparatus, furniture, and stores showed an increase of over £67,000 due to additional installations and purchases in anticipation of future business. Investments in associated companies had been increased by £18,000 by further subscriptions for shares in associated companies abroad. Although the profit was £53,000 in advance of the previous year's, it would have been £65,000 more had it not been for the agreement by which the company allowed shipowners a substantial rebate of rental for ships laid up for more than a month; there were many ships laid up for long periods, but an improvement had occurred during the current year, and they could look forward

to a further substantial improvement in the accounts. The loss upon the conversion of foreign earnings into sterling also affected the results considerably. The success of the undertaking was due solely to the increased volume of business; the rates had remained at the 1914 level, a fact of which they were proud. The marine-pattern direction-finder had had an excellent record during the past year in the matter of saving life, ships, and cargoes, apart from the saving of time in dense fogs. He gave one or two instances of its successful employment, and stated that several of the larger ship-owning companies had adopted it.

In connection with Mr. Franklin's experiments with the "wireless lighthouse" on Inchkeith Island, the steamer *Royal Scot*, owned by the London and Edinburgh Shipping Co., Ltd., had been fitted with a special type of receiver, which could be worked by the ship's officers, by means of which the signals from the "lighthouse" were picked up, enabling the navigator to pick his way through the dangerous channels of the Firth of Forth in the densest fogs.

High-speed transmitting and receiving apparatus had been installed upon the White Star liners *Majestic* and *Olympic*, and it was hoped to extend the use of this equipment to other vessels where the traffic warranted it. The question of broadcasting at sea was under consideration, and there seemed to be no reason why eventually additional revenue should not accrue to the company through this channel. Another question under consideration was the communication of ships with land stations by radio-telephony.

New depôts had been opened at Hong Kong and Port Said to provide for the adequate inspection of ships' installations.

In reply to a shareholder, he said that the results of working showed that the company had not much to fear from the competition of other companies. The report and accounts were adopted.

Ward and Goldstone, Ltd. The net profit for the year ended March, 1923, after providing for bad and doubtful debts, depreciation on machinery, plant, stock, salaries, commissions, directors' fees, advertising, and all other charges, excepting income tax and corporation profits tax, was £22,882, of which, it is estimated, income tax and corporation profits tax will absorb £6,454, leaving £16,428, plus £7,808 brought forward. After meeting the preference dividend of 7 per cent., and paying 7 per cent. on the ordinary shares, applying £2,000 in further reduction of preliminary expenses account, and putting to reserve for depreciation on investments £4,500, £10,648 is to be carried forward. During the early part of the financial year, trade conditions proved unsatisfactory, and the works were only engaged to a limited extent. The concluding months of the year provided distinct improvement, and several departments were occupied to their full capacity.

German Companies. The directors of the *Berlin Elevated and Underground Railway Co.* recommend a dividend at the rate of 40 per cent. for 1922, as contrasted with 5¼ per cent. in the previous year.

The *Koerting Electricity Works Co.*, of Berlin, reports that the net profits increased from 2.5 millions of marks in 1921 to 19.9 millions last year. The dividend, which was at the rate of 50 per cent. in 1921, is proposed at 0.02 per cent. in gold marks for 1922.

The directors of the *Berlin A.E.G.* propose to increase the ordinary share capital from 900 to 1,200 millions of marks by the issue of new shares for 300 millions. The shares have been taken over by a banking group which has undertaken to hold them at the company's disposal. In connection with the issue the group will offer to the holders of the preference shares of 1920 and 1921, to exchange these shares for new ordinary shares on a certain basis.

The *Continental Co. for Electrical Undertakings*, of Nuremberg, whose financial results have already been recorded, reports the provisional conclusion of negotiations with the Government in regard to the payment of compensation for the loss of the Jassy electricity works in Rumania, and of participations in other countries, resulting from the Treaty of Peace. The directors state that an agreement has now been reached for the payment of a lump sum which, however, represents but meagre compensation having regard to the depreciation of money.

Prospectus. *Newfoundland Power and Paper Co.*—This company has this week offered for subscription an issue of £2,000,000 4½ per cent. "A" mortgage debenture stock at 95 per cent., guaranteed as to principal and interest by His Majesty's Government. The company owns valuable water rights, and a contract has been concluded with Sir W. G Armstrong, Whitworth & Co. for the construction of a complete electric power development costing £1,755,500. The proceeds of the issue will be expended primarily in the purchase of plant and machinery, &c., manufactured in the United Kingdom. This is a very welcome circumstance. We would that the investing community would exercise its discrimination in favour of issues which will be expended in this way. One cannot but regret it when one reads prospectuses for large sums which will go to other manufacturing nations which have little unemployment.

New General Traction Co., Ltd.—The revenue for the year ended March, 1923, amounted to £12,712. Profit £5,864, compared with £9,999 for the preceding year. The reduction in profit is partly due to loss of income resulting from sale of holding of $729,000 Darby Media and Chester Street Railway bonds, and subsequent application of the proceeds in the purchase of the greater portion of the company's own outstanding debentures. Directors recommend placing to reserve £9,000, dividend of 2 per cent., less tax, carrying forward £2,267.—*Financial Times.*

Stock Exchange Notices.—Applications have been made to the Committee to allow the following to be quoted in the Official List:—

Babcock & Wilcox.—2,148,828 ordinary shares of £1 each, fully paid, Nos. 2,148,829 to 4,297,656.

Kaministiquia Power Co.—$297,000 capital stock.

The undermentioned securities have been ordered to be quoted in the Official List:—

Central Electric Supply Co.—£650,300 5½ per cent. secured and guaranteed redeemable notes (registered), within Nos. 1 to 1,282 (£50), 1 to 2,465 (£100), 1 to 264 (£500), and 1 to 370 (£1,000).

Chili Telephone Co., Ltd.—The *Financial Times* states that the profit for the year ended March 31st, 1923, was £35,569, plus £3,274 brought in, making £38,843. The directors recommend a final dividend of 3s. per share, making 6 per cent., free of tax, placing £6,000 to reserve for renewal of plant, carrying forward £3,143.

Cape Asbestos Co., Ltd.—Dividend of 10 per cent., less tax, on the ordinary shares and a dividend to the preference shareholders of an amount equivalent to the dividend, less tax, on the ordinary shares. Carried forward, £5,504.

Major & Co., Ltd.—The directors recommend a final dividend of 4½ per cent. on the preferred ordinary shares, making 8 per cent.; dividend of 10 per cent. on the ordinary shares; carrying forward £2,443.

American Telephone and Telegraph Co.—According to the New York correspondent of the *Financial Times*, the earnings for the six months ended June were: Gross inc. $o,513,000: net inc. $6,127,000: surplus inc. $3,151,000.

Thomas Bolton & Sons, Ltd.—Dividend of 2½ per cent., less tax, on the ordinary shares, making 5 per cent. for the year; £10,000 to reserve for depreciation and £24,633 carried forward.

Hendon Electric Supply Co., Ltd.—At a special meeting held on Monday, a resolution was brought forward to subdivide each of the existing shares of £5 each, both ordinary and preference, into five shares of £1 each.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—Interim dividend of 5 per cent. on the ordinary shares for the half-year ended June 30th.

Electrical Utilities Corporation, Ltd.—Dividend of 1¼ per cent. on the preferred stock for the quarter ended June, 1923.

County of London Electric Supply Co., Ltd.—Interim dividends of 3 per cent. on the preference and 4 per cent. on the ordinary shares.

Brazilian Traction, Light and Power Co.—Quarterly dividend of 1 per cent. on the ordinary capital stock.

Smithfield Markets Electric Supply Co., Ltd.—Interim dividend of 3 per cent. on the ordinary shares.

Bournemouth and Poole Electricity Supply Co., Ltd.—Interim dividend of 3¼ per cent. on the ordinary shares.

STOCKS AND SHARES.

TUESDAY EVENING.

THE Stock Exchange is not looking for that further rise to 5 per cent. in the Bank Rate which was talked about some ten days since. The retention of the 4 per cent. rate last Thursday coincided with an easier tendency of money in New York, where, for the time being, the centre of monetary rates revolves. Some of the English economists are very angry with the Bank of England for putting up the rate from 3 per cent. to 4 per cent. at a time when British trade requires every assistance and support that it can obtain in the way of cheap financial facilities. They contend that our industries deserve prior consideration to the exigencies of the United States. The question, however, is not only a wide one, but distinctly academic, though its discussion touches, of course, every branch of commerce in the Kingdom. The effect of the 4 per cent. rate is still felt to some extent in the popular industrial shares, though the Electricity Supply list remains exceedingly hard, and there is no difficulty in placing fresh issues at prices which offer temptation in the way of reasonable interest on sound security.

The latest scare over wireless development, as it concerns the cable companies, may now be said to have almost passed off. Prices have not yet recovered the full extent of the losses which they incurred a fortnight ago, but the market has steadied considerably. Quotations have been advanced, and, instead of sellers being predominant, the position has changed, and there are once more buyers making themselves heard in the land. Eastern ordinary has recovered to 177½ xd. and rallies took place in Eastern Extension, Westerns and Globes. Marconis themselves, after being a good market at 2 5/16 and giving way to 2 3/16, hardened up a trifle to 44s. 9d. Marconi Marines derived strength from the meeting last Friday, at which Mr. Godfrey Isaacs, the chairman, spoke with cautious hopefulness of the future. He referred to the difficulties which surrounded the development of broadcasting with regard to shipping, but looked forward with confidence to the time when these should be overcome. Indo-Europeans remain a feature of strength, with a further rise to 31¼ on rumours, so far unconfirmed that the company had come to an arrangement with the German Government in the matter of the lines which traverse Germany. In other Telegraph and Telephone descriptions there is little change. The market for the manufacturing shares is also quiet.

Tokio Electric 6 per cent. debenture, offered the other day at 94, and promptly over-subscribed, fell to 2 discount on sales by stags who were allotted more stock than they felt inclined, or were able, to pay for. As soon as these sellers had finished, the price promptly recovered to 7s. 6d. premium, large lines changing hands up to 12s. 6d. premium. The City of Lima debenture stock, to which somewhat similar conditions applied, has firmed up to "par," that is, the issue price of 90, and other new issue stocks are better maintained, comparatively speaking, than are most of those which, for instance, have come out lately in the Colonial and foreign Government markets. The new Madras Electric ordinary shares, offered at 22s., are changing hands on the basis of 1½d. premium. Sellers can obtain about 1d. for their rights, and it is probable that many of the proprietors will not trouble to take up their proportion, although it may pay them well to do so. Meanwhile the price of the old ordinary has given way a little to 22s. 6d., in consequence of sales made by holders who were realising these in order to pay for the new issue at the slightly cheaper price.

The Venezuela Telephone & Electrical Appliances Co., Ltd., is making an offer to its shareholders of 61,400 8 per cent. cumulative participating preference shares of £1 each at par. This is in accordance with resolutions passed at the meeting last week. There is a shilling per share payable on application and 19s. a week later, an effective hint to the stags that they are not wanted. The prospectus shows that the assets in the balance sheet cover the preference shares two-and-a-half times over, and that the annual revenue for the last four years would have sufficed to provide the dividend at about the same ratio.

Metropolitan District stock is 48, ex the dividend of 1½ per cent. gross, thus showing a small decline on balance. Metropolitans have been down to 67, but rallied to 67½. Underground Income Bonds are 2 up at 97. The City & South London Railway Bill, for the extension of that railway from Clapham Common to Morden, was rejected by a Select Committee of the House of Lords. This has aroused considerable local feeling in Mitcham and other parts that would have been served by the new extension. It is claimed that the localities, which it was proposed to benefit by the new railway, are badly off in the way of transport facilities, and no doubt, if not sooner, then later, the project will be more successful in Parliament than it has been this month.

Mexican matters move disappointingly; further falls have occurred in most of the bonds and shares of the Mexican Utility companies. Why this should be so, it is difficult to say, for the scheme under which the Mexican Government is endeavouring to meet its obligations goes forward steadily. However, Mexico Tramway Fives have dropped 2 points to 79½, and Mexican Light Common shares are equally lower at 28⅝. Brazilian Tractions rallied to 50½ in consequence of a better feeling that is apparent in regard to Brazilian securities as a whole, the rise in the milreis having put a little more heart into those who follow the fortunes of the country. London United Tramway debenture is down to 61½. London Suburban preference remain heavy at 9s. 6d.

In the list of manufacturing shares, General Electrics at 19s. 9d. are sixpence easier. English Electric preference at 19s. being also a trifle down. Babcock & Wilcox at 45s. are better on balance. A few Henley's 4½ per cent. preference have come to market, and the price gave way to 4⅜. At this, the yield on the money is no more than £5 2s. 10d. per cent., but so excellently secured are the shares that they will appeal to the real investor who puts safety and permanency first. Siemens weakened to 15s. Telegraph Constructions recovered the deducted dividend of 6s. per share. The rubber market is dull and uninteresting.

Electricity Supply shares are firm as a whole. City "Lights" and County ordinary receded 1/16 each. Metropolitans continued their advance. Edmundson's ordinary and preference are better to the extent of the dividends which their prices are now quoted ex. Whitehall Electric preference are a firmer market, although there is no quotable change in the price.

SHARE LIST OF ELECTRICAL COMPANIES.

	Nom.	Dividend. 1921.	Dividend. 1922.	Price July 17, 1923.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
Brompton Ordinary	£1	12	12	11½	—	£6 2 6
Charing Cross Ordinary	£5	9	14	11¼	—	6 4 5
do. do. do. 4½ Pref.	£5	4½	4½	4⅜	—	5 2 10
Chelsea	£1	6	10	1⅞	—	5 14 3
City of London	£1	14	15	2⅝	— ⅛	6 9 10
do. do. 6 % Pref.	£1	6	6	24/-	—	5 4 4
County of London	£1	8	10	37/6	— ⅛	5 6 8
do. do. 6 % Pref.	£1	6	6	23/9	—	5 1 1
Edmundson's Ordinary	£3	Nil	7	8xd	+ ⅛	7 0 0
do. 6 % Pref.	£5	12/-	6	4⅞xd	+3/8	6 8 0
Kensington Ordinary	£5	10	12	9½	—	6 6 4
London Electric	£3	4	10	4⅞	—	6 16 0
do. do. 6 % Pref.	£5	6	6	5⅞	—	5 11 7
Metropolitan	£1	7	8½	30/9	+9d.	5 10 7
do. 4½ % Pref.	£1	4½	4½	17/6xd	—	5 1 5
Newcastle-on-Tyne Ordinary	£1	Nil	2½	⅞	—	2 17 1
do. 5 % Pref.	£1	5	5	16/3	—	6 3 1
do. 7 % Pref.	£1	7	7	24/-	—	5 16 8
Notting Hill, 6 per cent. Pref.	£10	6	6	9½	—	6 6 9
North Met. Elec., 6 % Pref.	£1	6	6	22/-	—	5 9 1
Urban Ordinary	£1	Nil	—	15/-	—	Nil
do. 5 % Pref.	£1	2½	5	18/9	—	6 8 0
St. James' and Pall Mall	£5	12	14½	11⅞	—	6 2 1
South London	£1	7	10	1⅛	—	5 10 4
South Metropolitan Pref.	£1	7	7	1⅛	—	5 12 0
Westminster Ordinary	£5	10	12	9⅞	—	6 3 1
Whitehall Elec. Invst., 7½ % Pf.	£1	7½	7½	19/6	—	7 13 10
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	7¼	—	5 8 1
Metropolitan	£1	2½	3½	67½	—1	5 8 8
do. District	£1	1	3	48xd	—1	6 5 0
Underground Electric Ordinary	£10	Nil	Nil	2⅛	—	Nil
do. do. "A"	£1	Nil	Nil	8/6	—	Nil
do. do. Income	Stock	4	5	97	+2	*5 3 3
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	103½xd	—	5 16 0
do. Def.	£1	1½	84/6	23½	—	6 7 8
Chile Telephone	£5	6	6	6¼	—	4 18 0
Cuba Sub. Ord.	£10	7	7	7½	—	9 6 8
Eastern Extension	£10	10	10	17⅛xd	—	5 13 6
Eastern Tel. Ord.	Stock	10	10	177½xd	—	5 12 3
Globe Tel. and T. Ord.	£10	10	10	17⅞	—	5 12 8
do. do. Pref.	£10	6	6	11⅞	—	5 5 6
Great Northern Tel.	£10	24	22	27½	— ½	8 1 6
Indo-European	£25	10	7	31¼	+1	5 11 1
Marconi	£1	25	15	2⅛	+ 1/16	6 13 4
Oriental Telephone Ord.	£1	12	12	21½xd	—	*4 9 3
United R. Plate Tel.	£5	8	8	6⅝	—	*5 16 4
West India and Panama	£10	Nil	Nil	1/6	—	Nil
Western Telegraph	£10	10	10	17⅞	—	*5 12 5
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams. First Pref.	£5	5½	12½	8⅞	—	8 9 6
do. do. 2nd Pref.	£5	Nil	5½	2½	—	9 15 6
do. do. 5 % Deb. Stock	£5	5	5	77½	—	6 9 0
British Electric Traction Ord.	£1	4½	5	73½xd	—	6 16 1
do. do. 6 % Pref.	£1	6	6	98½xd	— ½	6 1 3
Brazil Tractions	£100	Nil	4	50½	+1	7 18 6
Brit. Columbia Elec. Ry. Pcs.	Stock	5	5	86½xd	—	5 15 7
do. do. Preferred	£1	5	96/-	81½xd	—	*5 18 9
do. do. Deferred	£1	8	127/-	89½	—	*7 2 6
do. do. Deb.	£1	4½	4½	80	+1	5 6 0
Lond. & Sub. Trac. 5 % Pref.	£1	3½	5	9/6	—	10 0 0
London United Tram. Deb.	Stock	4	4	61½	—1	6 10 0
Mexico Tram. 5% Bonds	—	Nil	Nil	79½	—2	6 5 9
do. 6 % Bonds	—	Nil	Nil	59½	—1	Nil
Mexican Light Common	£100	Nil	Nil	28⅝	—2	Nil
do. Pref.	£100	Nil	Nil	5⅛	+ ⅛	Nil
do. 1st Bonds	—	Nil	5	65½	—1	7 13 5
MANUFACTURING COMPANIES.						
Babcock & Wilcox	£1	15	20	2⅛	+ 1/16	4 9 0
British Aluminium Ord.	£1	10	5	18/9	—	5 6 8
British Insulated Ord.	£1	15	15	2⅛	—	6 3 6
Callenders	£1	15	15	2½	—	6 0 0
do. 6% Pref.	£1	6½	6½	23/9xd	—	5 9 5
Crompton Ord.	£1	10	5	⅛	—	8 17 6
Edison-Swan	£1	10	Nil	4/3	—	Nil
do. do. 5 % Deb.	Stock	5	5	65	—	7 13 10
Electric Construction	£1	10	10	1½	—	6 16 1
English Electric	£1	8	5	17/9	—	5 12 5
do. do. Pref.	£1	6	6	19/-	—6d.	6 6 4
Gen. Elec. Pref.	£1	6½	6½	23/3	—	5 11 10
do. Ord.	£1	10	5	19/9	—6d.	5 1 5
Henley	£1	15	15	2⅛	—	6 8 0
do. 4½ Pref.	£5	4½	4½	4⅜	— ½	5 2 10
India-Rubber	£1	10	—	⅛	—	—
Met.-Vickers Pref.	£2	8	8	2½	—	6 8 0
Siemens Ord.	£1	10	10	15/-	— ⅛	Nil
Telegraph Con.	£2	20	20	20½xd	+6/-	*4 15 0

* Dividends paid free of Income Tax.

THE NATION AND ITS INVENTORS: A REPLY.

By THOS. E. ROBERTSON, O.B.E., A.M.I.E.E.

THE article under the above heading which appeared in your issue of June 22nd last, calls for a vigorous rebuttal of the unwarranted attack by your correspondent upon the integrity of the British judiciary, the Legislature, and the nation.

No rational person will believe for a single moment that the patent law is "*provided* with traps and snares" or that British judges "invent traps by which inventors may lose the benefit of their ideas," or that the nation presents a "Shylock-like attitude to inventors."

As regards the Legislature, it has done very handsomely for the inventor. Monopolies are repugnant to the State, yet the inventor is the one and only person who is granted a monopoly. Where monopolies are concerned, the public needs as much protection as the inventor. During the last 40 years legislation has progressively reduced the cost of patenting, afforded protection against the abuse of monopoly rights, extended the duration of letters patent, prevented, as far as possible, the granting of worthless patents and simplified procedure with a view to saving expense. There is no ground for attacking the Legislature.

As regards the British judiciary, there is no finer institution in the world, and the judges have always been scrupulously careful to safeguard the interests of the inventor as well as those of the public. The writer of the article referred to dwells on the "flimsy pretexts" which are sufficient to destroy "valuable patents," but says nothing about the flimsy grounds upon which patents have been upheld. Take, for example, the following dicta of learned judges:—

"No smallness or simplicity of invention will prevent a patent from being valid," *per* Lord Halsbury.

"It may be that the invention is a small one, but slight differences in these cases sometimes produce large results," *per* Lord Davey.

"It is an invention, and not the less an invention because it requires small inventive powers to enable the patentee to do it," *per* Bramwell, L.J.

Consider also some examples of patents upheld by the Court:—

The substitution of a round wick for a flat wick in a lamp.

The addition of a hinge to the folding sides of a camera previously unhinged.

A safety device or life-guard for motor omnibuses, although side guards and front guards for tramcars were well known.

The case of the man who invented a fire-grate appears to be misstated by the writer. The patent referred to was Taylor's, who had his patent revoked on the ground that *someone else* had used a practically identical fire-grate in *his* house, where it was seen by his friends and openly exhibited before the date of Taylor's patent.

As for the nation, there is no taint of Shylock in its attitude to those inventors who have applied to the Commission on Awards to Inventors, which has been sitting since 1919, and has made hundreds of awards to inventors of *unpatented* inventions, ranging in value from £100 to over £110,000 in individual cases.

The Statute of Monopolies passed in the reign of James the First, 1623, which is still in force and is the basis of our present patent system, lays down that a patent shall not be granted for an invention which is hurtful to trade or generally inconvenient. It is conceivable that an invention might suddenly throw, say, a quarter of a million miners out of work, in which case the consequences might be so grave as to justify the State prohibiting its use or regulating its gradual application so as to minimise distress. Clearly, the public has rights as well as the inventor.

An invention to be patentable must be a manner of manufacture, it must be novel, and it must display the exercise of inventive ingenuity either in its conception or in its execution. If it lacks any one of these characteristics it is not patentable, and any patent granted is invalid. On the point of novelty, the Patent Office makes a search through the specifications of prior patents published, and affords the applicant, when necessary, an opportunity to amend his specification and claims to avoid anticipation, merely because the Crown cannot grant two valid patents for the same invention. It is impossible for the Patent Office to investigate cases of prior use and other forms of prior publication. Since the applicant for a patent declares that he is the true and first inventor, the Crown takes him at his word; but if it transpires in a Court of Law at a later date that the invention is not new, the Crown has been technically deceived, and the patent is invalid. Similarly, if the Courts find that the invention is not a manner of manufacture or that it is not ingenious, the patent is bad. If an invention does not involve inventive ingenuity, but is of such a nature that anyone skilled in the art could carry it out upon the mere suggestion of the end to be attained, it would be unfair to rob the public of any right it already possessed by upholding a patent thereon.

Those unfortunate inventors who have exaggerated ideas as to the commercial value of their inventions are generally unable to see the business man's point of view. They talk glibly of revolutionising an industry. Revolutions in industry are the accretions of time. The invention of the fly shuttle in weaving overtook the power of spinning before the inventions of Arkwright's spinning frame, Hargrave's spinning jenny, and Crompton's mule jenny completed the revolution. Crompton unfortunately omitted to patent his invention, but Parliament granted him £5,000.

There are inventors who can never be brought to appreciate the fact that a year or more is required to reduce an invention to a commercial proposition, that large sums of money must be spent on tools, jigs, and materials, that sales organisation involves heavy expenditure, and that the manufacturer does not pay dividends on philanthropy. The business man who finances an inventor requires all the security he can get, and if the patent is not sound there is little hope of its being exploited. Inventive power alone leads nowhere without the complement of business acumen, resource, and an intimate knowledge of the commercial conditions. These complementary attributes are rarely combined with inventive genius, and inventors who lack them must learn to be reasonable, like their more successful fellow inventors, and to share the profits with those who are able to market their inventions successfully.

Every inventor should know what Mr. Ll. B. Atkinson, Past President of the I.E.E., said when he was at a dinner of the Chartered Institute of Patent Agents. Speaking of his own inventions, he said he had always been content with a moderate reward, and after 20 years was pleasurably surprised at the magnitude of the sum total.

Industrial Power in Ireland.—The annual report submitted at the meeting of the Cork Irish Industrial Association contained the following passage:—"Power for Industries.—As Ireland has been in the past mainly dependent on British coal as a source of power used for industrial purposes, the Association recommends that generating stations be set up near the pit heads of Irish coal mines, namely, at Castlecomer, Wolfhill, and Arigna. The power generated at these stations could be transmitted at a minimum cost all over the country." To supplement this it was suggested that all available water power on such rivers as the Shannon should be harnessed for the generation of electric power. By utilising Irish resources in this fashion, the annual importation of from five to six million tons of coal could be very appreciably reduced.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

ANNUAL CONVENTION.

(*Concluded from page 74.*)

Modern Generation Applied to Existing Distribution.

By FREDK. W. PURSE.

(*Abstract.*)

THE paper deals with the means adopted for reorganising and adapting an existing distributing system so as to make it suitable for being supplied by a modern system of generation. With few exceptions all generating plant installed in the future will produce three-phase high-tension current. The distribution question can be divided under two headings:—

(1) Where the original system was high-tension alternating current, either single or two-phase.

(2) Where the original system was low-tension direct-current.

Two tables are given in the paper—one for low-tension and the other for high-tension cables—showing the possibilities of using cables on systems other than those for which they were originally designed.

The simplest case is where all the existing d.c. network is retained and the a.c. supply is all converted to d.c. low-tension. The various means of effecting the conversion were fully dealt with by Mr. Chattock in his able paper last year. In a number of cases a simple change of this character has been sufficient to meet the needs of the district, but in other cases, particularly large towns, it has been found desirable to supply large consumers direct from the a.c. supply by construction static sub-stations on the premises, and by this means a considerable saving is effected both in mains cost and conversion. In some towns where the load has outgrown the capacity of the d.c. mains, it has been found necessary to lay new mains for a.c. instead of d.c.; the a.c. mains are in addition to and not substitution for the existing d.c. mains.

Where high-tension a.c. supply is available it has been found useful to utilise it for all outlying districts, and the principle which can and has been adopted is to define a zone outside which all supplies are to be a.c.

The above cases have not called for any material change in the existing distribution network. Whilst the initial cost would probably be lower by simply installing converting plant, against this has to be set the permanently higher cost of converting all the supply to direct current, and, if the district is a scattered one, in laying mains of sufficiently heavy section to avoid serious voltage fluctuation, a difficulty likely to be accentuated if the heating and cooking load grows to any substantial dimensions.

Still dealing with the cases where the original system was three-wire d.c., it has in a number of instances been found desirable to change over the l.t. network and feed it direct from the a.c. supply. This has been done in some instances by connecting the phases individually to each three-core cable and supplying it as a single-phase three-wire system; in other cases two of the phases have been connected to the outers or positive and negative of the three-wire distributors and the neutral connected to the centre point of the three-phase.

In both cases care has to be taken with regard to balance, and in the latter instance a disconnecting box has been used into which the three phases of the a.c. are run and so arranged that the distributors can be changed over from one phase to another in order that the balance may be preserved as nearly as possible.

Where a change-over of this character is made, the meters, motors, and possibly sundry appliances have to be changed for a.c., and if there is an alteration in voltage the lamps as well must be changed. No doubt the cost of change-over when these items have to be taken into account is a serious deterrent, but the problem will have to be faced in the near future when the supply is purchased in bulk, and the engineer will have to balance the initial cost of the change-over against the annual higher cost of supply if it all has to be converted from a.c. to d.c.; whichever course is adopted, it is bound to take the cream off the advantage derived by obtaining a bulk supply from one central source.

By a careful study of the lay-out of the existing distribution system, and by a judicious use of suitably-wound transformers, there is no serious technical difficulty in changing over a part or the whole of a d.c. network to a.c., and all new mains laid can be four-core suitable for directly connecting to the a.c. supply.

As an instance of what is involved in a somewhat complicated change-over, Walsall is of particular interest as, starting originally with high-tension d.c. supply converted to l.t. d.c., this gave way to 3,300-volt a.c. supply converted to d.c., only to give way in turn to 6,600-volt a.c. supplying direct to the l.t. network through static transformers. [Details are given in the paper.]

Passing now to the perhaps less complicated cases where the original system was a.c. in one form or another, the predominant system was single-phase, either two- or three-wire, but unfortunately of varying frequencies. When the frequency of the new supply differs materially from the existing supply, the change-over involves considerable alteration to existing motors, meters, transformers, &c.

Where it is proposed to shut down entirely the existing generating plant, the new three-phase supply can be converted through Scott-connected transformers to two-phase at the required voltage and the existing single-phase feeders balanced as nearly as possible across the two phases; by means of suitable links it can be arranged to change over some of the feeders from one phase to the other so as to maintain the balance as occasion arises. In the case of Hampstead such a change-over has been made. [Details are given in the paper.]

It is not, of course, essential that Scott-connected transformers be used, as the existing single-phase feeders can be connected to and balanced across the individual phases of the three-phase supply with provision for changing feeders from one phase to another to maintain balance; local circumstances must decide what is the best in each individual case.

Where it is proposed to retain for the time being the single-phase generating plant, it would appear desirable to adopt the Scott transformer principle with two phases, as by this means the single-phase generating plant can be paralleled on to the two phases and used either for maintaining the balance or supplementing the supply from the new three-phase system.

Where change of frequency is involved it is possible to use frequency changers or other suitable apparatus located in the main or sub-stations, and by this means eliminate the cost of changing transformers, motors, meters, &c. This is really a question of £ s. d.; in other words, will the first cost of a complete change-over outweigh the lesser initial cost of installing suitable frequency-changing plant coupled with the higher annual cost of running such a plant?

In many cases where the original system was single-phase there have, for many years past, been steady developments in the introduction of multiphase generating plant to meet the increasing demands.

It has generally proceeded on the lines of re-winding, where possible, existing plant to give a two-phase supply and then balancing up the existing feeders on each phase. Where feeders on each phase in a district are in close proximity they can be tapped to furnish a two-phase supply, or new two-phase feeders can be laid from the nearest suitable point. Provided the frequency is the same, or nearly so, this scheme does not necessarily involve the scrapping of any existing transformers or sundry apparatus.

If the original generating pressure was h.t., say 2,000 volts, then any new plant can be installed for e.h.t., say 6,000 volts, and new feeders laid to suitable points in the district, and by transforming from 6,000 to 2,000 volts the existing h.t. mains can be used as secondary transmission lines and their useful carrying capacity substantially increased. Where possible a straight transformation from 6,000 volts to the requisite low pressure can be adopted and so dispense with the intermediate transformers. Age and general condition may warrant this in a number of cases.

When a system has been changed over to two-phase or perhaps originally installed as two-phase, then any additional plant or supply of a three-phase system can be applied, but it involves the use of Scott-connected transformers. There are cases in this country where the generation is all three-phase and supplies are being given at the present time to consumers at one, two, and three-phase.

[The case of Stoke-on-Trent is referred to in detail in the paper.]

Many d.c. systems consist of single-core lead or armoured cable. In changing over to a.c. extra losses would be incurred due to the currents induced in the metal sheathing, which are proportional to the square of the current. Although the losses may be ignored for ordinary plain lead cables, the heating due to them precludes the use of single-armoured cables on a.c. systems. When two- and three-core cables are used, so that the go and return are surrounded by the same sheath, the losses are not serious.

In the case of a single-core cable passing through an iron pipe without the return being in the same pipe (a condition which may be safe for d.c. working), a change-over to a.c. cannot usually be considered on account of the extensive loss, voltage drop and dangerous heating.

It is assumed in all cases where a change-over from d.c. to a.c. is effected that the voltage in both cases is kept the same. As a matter of fact, under the new conditions the insulation is subjected to a higher maximum value, with conse-

ment greater risk of breakdown, especially if the cable is not in very good condition.

Where the system is to be changed from d.c. to a.c., the cost of changing all the meters must be faced, but where there is only a change of voltage or frequency involved, some use may be made of the existing meters. Meters wound for 100 volts can be used on a 100-volt circuit without alteration, or even recalibration. It is not possible to use a meter wound for 100 volts upon a 200-volt circuit, because that would produce excessive heating of the pressure coil. Meters may be used on voltages varying between 200 and 250 without recalibration and without appreciable variations in accuracy. A meter may be used on fairly wide variations of frequency, provided the load is non-inductive, but errors will be introduced on inductive loads if the frequency varies widely. It would appear, therefore, that small house meters may be used on an altered frequency without attention, but the larger and more important meters should be recalibrated when the frequency is changed.

When an induction motor is run at a higher frequency than that for which it was designed, it will speed up in proportion to the frequency, and it will in general be capable of carrying full load, but the over-load capacity may be slightly reduced. If the full over-load capacity is required, the voltage on the motor should be raised in proportion to the increased frequency. When an induction motor is run at a lower frequency than that for which it is designed, the speed falls in proportion to the frequency, and if the voltage is maintained constant, the power factor will be reduced and the motor will tend to overheat. If, however, the voltage is dropped in proportion to the frequency, the motor will give the same torque as at normal frequency, but the output will be reduced in proportion to the speed.

The above remarks apply to small variations in frequency, such as from 40 to 50 cycles, or from 50 to 60. In these cases, bearing in mind that many of the older motors have a very liberal rating, a change in the pulley may be all that is necessary.

If any large variation in voltage or frequency is involved, it will be necessary to replace the motor, but nevertheless it may be possible to re-wind some of the motors taken out and by this means minimise the cost of the change. It is possible to use the existing modern transformers under certain changes of periodicity. In the case of an increase in periodicity, the regulation will increase approximately in proportion to the increased periodicity. The iron loss will vary approximately as the square root of the ratio of the periods, thus giving a higher efficiency. On the other hand, a slight decrease in the periodicity will have a marked effect on the performance of the transformer. The iron losses will be increased. The magnetising current may be very largely increased. A 20 per cent. reduction in the periodicity may be sufficient to render the transformers totally unsuitable. The regulating or booster gear for use on a.c. circuits is much more simple than for d.c. and may be either of the tapping type or induction type, both of which are generally well known.

It is frequently found necessary to install small boosters in individual feeders to maintain the correct voltage under varying loads, as in the case of long feeders supplying a mixed power and lighting load. Such an arrangement is efficient, reliable and inexpensive.

There is no difficulty in converting super h.t. voltages, which are now more frequently employed, down to any required voltage in one transformation. Instances in the last few years are those of transformers stepping down from 30,000 volts three-phase to 70 volts three-phase for furnace working; from 30,000 volts three-phase to 375 volts six-phase for rotary converters; and from 100,000 to 5,000 volts for ordinary power working. It must be realised, however, that the installation of transformers of small output for these super-voltages is not desirable, not only on account of the relatively high cost entailed by their use, but also by reason of the high cost of the necessary control gear.

Circuit breakers may have ample capacity for handling a short circuit on a system supplied from generating plant of a few thousand kilowatts, but may be totally inadequate to interrupt a short circuit when the local system is supplied from a very big power scheme. There are two methods of taking care of this difficulty:—

(a) Some of the circuit breakers on the local distribution system may be replaced by larger ones, and time limit settings applied on the breakers throughout the local system, so that a short circuit would be opened only on the larger circuit breakers; or:

(b) What is probably preferable, reactance coils may be inserted between the main supply system and the local supply system in order to limit the current rush in the event of a short circuit to a value which the circuit breakers on the local supply could handle.

From all the information received it would appear that where any change-over has been effected no serious difficulty has been encountered, and the new conditions have not proved less advantageous than the old ones.

Thanks are expressed to Mr. Yeaman (of Stoke-on-Trent), Mr. Howie (of Walsall), and other engineer members of the Association, as well as to manufacturing firms.

Discussion.

Mr. H. A. Howie (Walsall) said that the change-over at Walsall had involved a complete new generating station with an e.h.p. transmission system as well as the distribution system. The total cost had been considerable; he estimated that the cost of changing-over existing sub-station plant and mains was approximately £300,000, or about £4 per consumer. However, the results had proved that the policy of changing-over had been the right one, as the old system could not possibly have dealt with the present load nor could it have been expanded to meet the future needs of a large industrial town. The changing of individual consumers from d.c. to a.c. was still proceeding; in this way it had been possible to spread the cost over a long period. With regard to that portion of the l.p. network still supplied with d.c., he found it of greater advantage and cheaper, to extend the a.c. distributors to give new supplies rather than build up the d.c. load which would, in course of time, involve the provision of further rotary converters. As d.c. was required for tramways it was not proposed entirely to dispense with it, but eventually the d.c. would be confined to the centre of the town and one principal sub-station. This would have the advantage of keeping up the power factor of the general system.

Mr. C. Turnbull (Tynemouth) said it was important for committee members to realise that technical papers such as this were really commercial papers; the saving of ¼d. per unit might appear to be a negligible figure, but it was exceedingly important when taken in conjunction with an output of many millions of units. Some committee members were inclined to suggest at times that the engineers had no commercial sense, but inquiries among manufacturers of plant would soon prove that these, at any rate, held the opinion that the commercial sense of central-station engineers was developed to a greater extent than it might be. Another point he wished to bring to the notice of committee members was the inclination in some quarters to say to the engineer that if by reason of such changes as these the works could be simplified, then the engineer ought to take a lower salary because he had less work to do. If such an attitude were adopted in a general way, it would mean that engineers would not be encouraged to adopt the latest practice, but to continue with old and inefficient plant. On the technical side of the paper, he thought it would be an advantage if the three wires of a three-wire system could be used for a three-phase system, using the lead on the cable for the fourth wire as an earth return. If this could be done, it would save a great deal of money. Another point was that modern transformers were made with large reactance, which meant that the voltage regulation tended to be very bad. That brought in the question of boosters, and in his own case he was putting in a.c. boosters at the station where he got his bulk supply; the intention was to adjust the booster at various times of the day to keep the pressure as nearly right as possible.

Mr. A. Nichols-Moore (Newport, Mon.) remarked that he was making a change of frequency, and he submitted that that was one of the most important parts of the whole subject. His system was put down in 1895 as high-pressure, single-phase; the rubber-insulated cables laid then were still in use, and the problem was whether they could be used in connection with the change of frequency. The present system of generation was 6,000 volts, three-phase, 50 frequency, and it was decided to adopt Scott-connected transformers, one reason being that the l.p. a.c. network was very defective, and this was the only way to avoid the difficulties which would arise from the fact that the neutral of the three-phase l.p. transformer would have to be earthed. The single-phase supply had been grouped into areas of 500 kW, and these groups had been arranged on a system of sections through Scott-connected transformers. The change of frequency was from 87½ to 50. In the case of three-core triple-concentric cables such as he had, the outers were practically earthed all over the place. When he was changing-over he made very careful tests of all the leading types of meters, and found only one meter which was at all accurate under the changed conditions of frequency.

Mr. J. G. Griffin (Delhi Tramways Co.) said that where it was a case of supplying an outside district on the d.c. system an excellent case could be made out for Diesel engines with an output of not less than 15 million units, and a load factor of say 15 per cent. In such a case, the total cost of generation would not exceed 0.8d. per kWh. Of course, a.c. could be generated at the same cost, but if a.c. was required in the outlying districts it would, no doubt, be generated at the central station. For small undertakings, where it was foreseen that a.c. would be inevitable in the future—and probably in the majority of cases that would be so—alternators might be added in tandem to two or three of the machines in the station. These would take care of the a.c. load for a few years until it was thought desirable to add a.c. plant to the power station, and the prime movers to which they were fitted could be run at full load irrespective of the power factor.

Mr. C. G. Morley New (Cardiff) said that the position in Cardiff was that the old single-phase station was at one end of the town and a modern station at the other, and the single-phase load was increasing considerably in the vicinity of the

modern station. Therefore, it was decided to put in frequency changers and run a trunk main from the main station. The load still increased, however, and it was found that the loss in conversion was very heavy, so three-phase feeders were run out to a sub-station which was built in the vicinity of each power station to get on to the single-phase network. Thus although since 1908 there had been a great increase in the single-phase load there had been no necessity to put down new feeders or plant. The change-over in his case was comparatively simple, from 40 to 50 cycles. With regard to motors, in most cases it was only necessary to change the pulleys and alter the starting gear, but some people wanted extra speed on their motors, and in one case the foreman of a planing shop put on extra speed and the thing burst. This question of extra speed after the change-over was an important matter in connection with such things as milk separators, band saws, &c. In other cases the consumers asked for new motors. The serial numbers of the motors were taken, and the manufacturers were asked whether the machines would run under the new conditions. It was curious to note that, generally speaking, where the manufacturers said they would not, the machines ran quite satisfactorily. In another case, a consumer said his plant had gone all wrong since the change-over when in fact, although the change was being made in that particular district, it had not been made in respect of that consumer. The whole of this work had been paid for out of revenue; it had enabled him to meet a large increase of domestic load.

Mr. C. W. SALT (Carlisle) said that in spite of excellent wiring rules, he had come across instances where large circuits were wired with one polarity in separate tubes, and in any change-over in such a case there was a heating effect, which might not be very serious, and there was also a sound effect which might be very annoying, especially where close-joint tubes were used. He thought at present it was best, when dealing with a change-over, to separate an area into two parts: A central area, and a zone which filled the space between the central area and the boundary of supply. In that outer zone it was desirable to make early preparations to purchase sites for static transformer sub-stations, and to lay out the system gradually for three-phase four-core distribution. In the d.c. area it was best to keep within the limits of the converting plant, and the carrying capacity of the feeders. He saw no objection to superimposing an a.c. network on a d.c. network, and it might be that that was quite a reasonable proposition. The star-star transformer had been used for three-phase four-core distribution, but the regulation was not so good on an unbalanced loading. Another point was that the star-star system could not be interconnected with delta-star. Although the voltages of the phases might be similar, there would be angular displacement.

Mr. P. P. WHEELWRIGHT (Blackburn) said that in Blackburn he originally changed over 4,000 consumers from 110 to 220 volts, and in that work he got to know more about the human side of consumers than he had ever thought possible. To talk about the legal side was exceedingly dangerous. If they started talking to the consumer from this point of view and told him what his powers were, they would find the amount of apparatus he had in his cellar would fill a showroom. As for meters, possibly on the old system the meter was reasonably accurate, but when the change-over was made it was not so correct, and the consumer would very likely say that it read on the fast side. He did not see why a preferential price should be offered to consumers on a change-over.

Mr. R. B. MITCHELL (Glasgow) pointed to a statement in the paper that where a change-over from d.c. to a.c. was effected, it was assumed that the voltage in both cases was the same, whereas under the new conditions the insulation was subjected to a higher maximum value, with consequent greater risk of breakdown, especially if the cable was not in a very good condition. In many cases the factor of safety in l.p. feeders and distributors was so high that even higher pressures could be admitted, certainly in the case of feeders in a system supplying 500 volts, d.c. As a case in point, there was a residential area in Glasgow, where the supply was d.c. fed from sub-stations, and the load was growing very rapidly owing to the introduction of cookers and other apparatus. He had not had any pressure troubles up to now, but he expected they would come very shortly. There was no temptation in Glasgow to change-over to a.c. distribution, because of the fact that the system was 25 cycles three-phase, and the problem was how to deal with this increased load at the least possible expense. It had occurred to him that the d.c. feeders now running at 500 volts could quite readily be worked up to 2,000 volts, three-phase, from the sub-station, which would increase their capacity considerably. He had been assured by cable makers that the factor of safety was sufficient to allow of this.

Mr. C. H. YEAMAN (Stoke-on-Trent) said that in the Long Eaton case it was stated in the judgment that the only justification for giving a reduction in price was a reduction in generating costs, and as the change-over made the supply cheaper, surely they were entitled to offer a preferential tariff. As regarded the attitude of committees towards this matter of changing over, he felt that the more progressive the engineer the more powerful the brake that should be put upon him by the committee in inquiring into the possible advantages and disadvantages of a change-over. Perhaps one of the troubles of the engineer in this matter was that he got his money too easily (he did not mean the small amounts which they got for themselves, but the money they were able to spend on their generating stations and systems) and, therefore, it was an advantage for any such scheme to be thoroughly examined by laymen, because if they could not convince the laymen of the advantages of any such scheme, it had better be left alone. There might be cases in which the saving in cost of units generated by the change-over would not pay for the capital charges on the new plant, and it would be well not to go too quickly into a change-over until all the circumstances of the case had been carefully considered. How was a network consisting of three single cables laid solid in either wood or stoneware troughing to be supplied when changed over? A number of schemes had been looked at in connection with such a case, and he ultimately decided to put down static transformer sub-stations and put on each of the three dimetrical legs, what some people called a double star, and other people a three-phase, six-phase dimetrically-connected transformer, but care was necessary because there was double balancing, inasmuch as they were balancing between the two sides of the three-wire system and also on each phase.

Ald. G. J. THRASHER (Mayor of Aylesbury) said that the wise member of a committee trusted his officers on a question of technicalities, but the function of the committee man was to find out what the work was going to cost, and what it was going to save. It had been stated that some committees took the view that when an engineer made the works simpler, he should have less money, because he had less work to do. He could not understand such an attitude, and he did not believe that that was the general view of committees when dealing with their officers. They did not think for a moment how cheap they could get them, but how good they could get their officers and how highly they could pay them.

Councillor MCLEOD (Hull) said that although committees should take the advice of their engineers, an engineer was liable to overlook the financial side, on account of his professional pride in the job he had undertaken. That was a great danger, whilst another danger to be looked at was that of obsolescence owing to the great progress that was being made by electrical science. There was no object in reducing the cost of generation by ½d. per unit, and so saving £10,000 a year if to do that involved an annual expenditure of £50,000. Therefore, it was for the engineers to show that their schemes would pay. At the same time, he maintained that every committee should support its engineer in every possible way. He was in favour of every engineer or other official being present at the Council meetings when these matters were discussed, so that he could give the Council the benefit of his advice.

Councillor W. HAMMER (Hackney) suggested that engineers in placing their schemes before their committees, should study the psychological point of view. Everything depended upon the way in which a scheme was placed before a committee. His own engineer once said that he only made things complicated when he was in an exceedingly difficult position, but he had got over that stage now, and felt he was safe in going forward and stating the bare truth. As to whether engineers could not develop the commercial sense, that depended upon the engineer, and so far as Hackney was concerned, they had no cause for complaint in that respect. It was necessary, however, for the engineers to show that there would be advantages. He entirely differed from the suggestion that the engineers should be present at Council meetings and express their views to the Council, because some engineers were so plausible and so eloquent that whether the scheme was good or not for the district they would be able to convince their Councils that what they advocated was the best of all things.

Dr. S. Z. DE FERRANTI said the paper was of the greatest possible importance. The greatest handicap which commercial electrical work suffered from was the variety which was possible in the ways of carrying out any particular job. All these different frequencies and different systems of supply which existed to-day put up the cost of producing the apparatus which was required, and the handicap was greater than might be imagined until one thought it out at very great length. This country, especially in relation to other countries, had suffered from this handicap, and it might be desirable to face a considerable percentage loss rather than allow this great variety of systems to continue. He would like to see, as much as possible, 50-period, three-phase working for every purpose for which current was available, and he felt that they should go right to the limit in endeavouring to get uniformity of supply and uniformity of apparatus. Only in that way would they get electricity at a sufficiently low rate to enable it to be so generally used that it would really help the country. As regarded the part of the paper concerning a change-over from d.c. to a.c., they had to think of what the future might bring forth. Before long transformation from a.c. to d.c. might become a very easy and cheap matter, and this would greatly affect the d.c. networks in use to-day. He would remind them that the New York Edison Co., which had an immense system, had never attempted to change-over the d.c. system in New York City to a.c.; the same applied to the

great d.c. network in Chicago. There were no doubt good reasons for this, and the possibility of being able to feed such networks with d.c. as easily as with a.c. had to be borne in mind. There was this great advantage in d.c., that it was one thing, practically without option, whereas in the case of a.c., it could be done in such a variety of ways. Lord Kelvin's opinion was that not only for distribution but also for transmission, continuous current was the best thing. Supposing the thing were possible, how nice it would be if they could have a single insulated conductor carrying a very high-pressure continuous current for transmission and then, by some means at present unavailable, transform that down to low pressure d.c. for distribution purposes. They would then get down to simplicity of the real sort which would be a most commercial thing in connection with electrical work.

Mr. S. G. MARSTON (Stockton-on-Tees) referred to the absence of trouble on a.c. as compared with d.c. networks, and the cheapness and accuracy of a.c. meters compared with d.c. meters. In his own town there was a d.c. network which had become dilapidated and completely overloaded, and it was a question whether heavier feeders should be laid and more rotary plant purchased, &c., or whether a new three-phase network should be superimposed upon the old network. This has been done in the centre of the town, because the feeders were hopelessly decentralised, but the difficult people such as those using meat choppers, cash registers, lifts, &c., were left on the old system because it did not pay to change over, say, an 8-h.p. motor which was going to cost £40 to replace. In the outside areas there was a hybrid three-wire system of concentric bitumen cables with the positive and neutral on one side of the street and a negative and neutral on the other side, with cross connections so that the positive and negative changed over from right to left. In addition, the original system was carried out with two-core concentric feeders with no neutral whatever, and balance was obtained by bringing the tail ends of two distributors into the works at one end of the town; the result was that they had to have boosters on the neutral, and he did not know what sort of condition it was in. This system being two-wire, lent itself to balancing street by street on the three phases with four-wire feeders. The system adopted, therefore, was to run a heavy four-wire feeder through the street and tap at each street corner and other points into network boxes and supply the old two-wire distributors from one phase and neutral of the four-wire system at different points. The result had been to raise the voltage from 230 to 250 volts, and to bring it into line with the standard voltage on the north-east coast, although the work had brought a host of troubles. With regard to changing lamps, it was useful to mark the lamps sent out in some way, so that when it was said they burned out they could be checked, because it was astonishing how many clothes baskets of old lamps turned up within a week after the change-over, or before it had actually taken place, it being said that the lamps had burned out.

Mr. PURSE, in reply, said the object of the paper was to indicate possible means of dealing with the conditions which the Electricity Commissioners were enforcing on supply-station engineers. The supply would, in the future, be three-phase a.c. 50 periods, and the Commissioners would insist on the type of plant being standard, even if some of the present generating stations were not forced to take bulk supply. The discussion had shown other means beyond those mentioned in the paper. As regarded transformers, the B.E.A.M.A. and the I.M.E.A. had a joint committee, of which he was a member, dealing with a specification, and it had been brought to the notice of that Committee that if there were to be transformers close up to the station the amount of reactance would differ considerably, unless particularly specified, from the amount which was ordinarily the case 20 miles away. That was a point which would come out when the specification was issued. Mr. Birkett had been successful in convincing the Commissioners that Diesel engines should be used in Southend, but he was afraid they would not all be so successful. It was a matter for the Commissioners, and what the Commissioners were imposing upon the industry, and they had to make the best of it. Mr. Yeaman mentioned the danger of going too quickly with changing-over systems, but the blame must again be put upon the Electricity Commissioners. He insisted that if an engineer could show a scheme for a change-over which produced results not less favourable than before, then he had shown not only technical but commercial ability. There were districts in which to change-over the central area would involve an awful cost, and after what Dr. Ferranti had told them—and he could always predict what was going to happen in 20 years' time—they would feel justified in keeping on with the d.c. system, in these cases.

A NEW RADIO RECEIVING CIRCUIT.

A Super-Sensitive 2-Valve Arrangement.

MULTI-VALVE receivers still, apparently, have to be used to obtain good results with a "loud-speaker," and yet there is a 2-valve arrangement which enables broadcast matter to be heard 100 yards from a "loud-speaker" at a distance of about 15 miles from the transmitting station—we refer to the interesting ST 100 circuit due to Mr. J. Scott-Taggart, which is exceedingly sensitive and will receive over long distances by means of a very small aerial.

According to *Modern Wireless*, from which the following details are abstracted, at the above-mentioned distance signals are quite audible in a room when using a "loud-speaker" and an aerial of from 8 to 16 ft. long only suspended from one wall to another in a room, or with a 2 ft. 6 in. square frame aerial. The ST 100 circuit works on any wave length and also gives excellent results with continuous-wave signals; although it operates quite well with a frame aerial (except, perhaps, at very long ranges), yet the signal strength will vary with the size and height of the aerial—a distinct advantage, because no one is particularly anxious to use a small frame when an effective ordinary aerial can be erected in or out of doors.

As a receiver for portable purposes, it is ideal; a complete outfit can be packed in a fairly large attaché case, employing dull-emitter valves which require dry batteries only. Such a receiver will reproduce 2 LO signals on a "loud-speaker" up to 20 miles with the smallest aerial. Moreover, the circuit can be reproduced by the beginner, it is very stable, does not produce howling noises, and undesirable capacity effects are absent, except, perhaps, when a very small frame aerial is used.

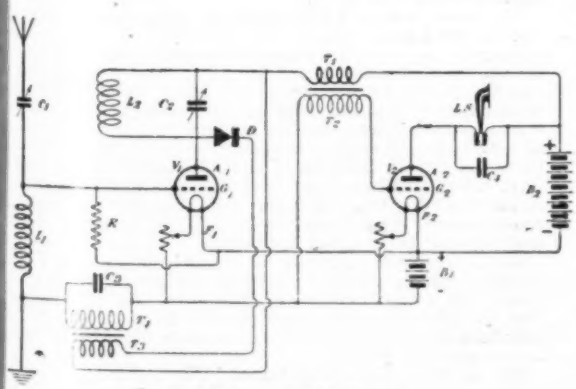


FIG. 1.—THE S T 100 CIRCUIT.

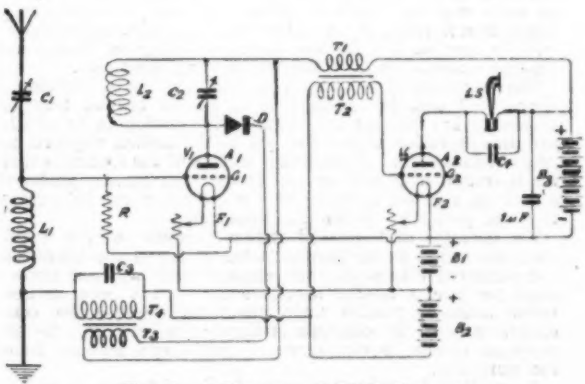


FIG. 2.—A MODIFIED S T 100 CIRCUIT.

There are several possible modifications of the ST 100 circuit, of which one form is shown in fig. 1. Between the aerial and earth there is a variable condenser C_1, having a maximum capacity of 0.0005 μ F or 0.001 (the advantage of using the smaller value being that a finer adjustment is obtainable), and an inductance coil L_1, which is connected between the grid G_1 of the valve V_1, and the secondary T_4 of an inter-valve transformer, the other end of which is joined to the

negative pole of a six-volt battery B_1. Between the grid G_1 and the positive pole of battery B_1 is connected a resistance R of from 50,000 to 100,000 ohms. To the anode A_1 of valve V_1 is joined a tuned circuit consisting of a coil L_2 and variable condenser C_2 having a maximum capacity of 0.0005 or 0.001 μ F; the smaller value is suitable for receiving 2 LO, and will also tune the set up to almost 600 m.

A crystal detector D is connected to the anode of valve V_1 and to the primary T_3 of the transformer above-mentioned; the other end of T_3 is led to the other side of the tuned anode circuit and to the primary T_1 of a similar transformer, whence a connection is taken to the positive pole of a high-pressure battery B_2 of 100 volts (in fig. 2 this battery is marked B_3). The secondary T_2 of the transformer is connected between the grid G_2 of valve V_2 and the negative pole of battery B_1. The headphone or loud speaker LS, shunted by a fixed condenser C_4 of 0.002 μ F capacity, is connected between the anode of V_2 and the positive pole of battery B_2, and the valve filaments F_1 and F_2 are fed from battery B_1 as usual. A fixed condenser C_3 of capacity 0.0003 μ F is preferably connected across the secondary winding T_4. Coil L_1 may be either a No. 50 or 75 Igranic honeycomb coil. The correct value of L_2 is important, and preferably different ones should be tried; coils Nos. 25, 35, 50, and 75 should be available, but for general purposes No. 50 will give satisfaction. L_2 and L_3 are coupled together if a reactive effect is desired, but they may be kept separate without much decrease of signal strength resulting; in any case the connections to L_1 should be reversed in order to find out which way round gives the loudest signal. Whenever any alteration or adjustment in the circuit is made, the condensers C_1 and C_2 should be slightly readjusted. Reaction must not be used when receiving British broadcast programmes.

It is important to keep all connecting wires as far apart as possible, but the operation of the set presents no difficulty. The coupling of L_1 and L_2 should normally be loose, and when small aerials are used the condenser C_3 should be connected directly across the aerial and earth. If reaction is tightened too much, a buzzing will probably be produced; to prevent it, the coupling should be loosened and the value of R reduced to, say, 70,000 or 50,000 ohms.

One of the main advantages of the circuit is that a natural tendency to howl is suppressed without sacrificing signal strength, but if the directions outlined above are materially deviated from the set may howl loudly.

The application of a negative potential of from 4 to 9 volts on the grids of both valves materially improves the quality of speech and the amplification. A modified circuit, in which is incorporated this feature (B_4), and a one-microfarad condenser across the high-pressure battery, is shown in fig. 2.

THE INSTITUTION OF CIVIL ENGINEERS.

Exhibition of Scientific Apparatus.

AT the annual conversazione of the Institution, which was held on July 12th, a collection of scientific apparatus, models, &c., was exhibited as usual, amongst which the Western Electric Co., Ltd., demonstrated a model set of its telephonic traffic-control apparatus. It was arranged to represent a typical railway equipment, and consisted of a controller's signalling and telephone apparatus at one end of a model railway telephone line and three typical sets of apparatus for use in signal cabins, &c., bridged at intervals across the line, all the sets being in simple multiple. It illustrated on a small scale equipment which is in use on many of the large railways in Great Britain and a number of the principal railway concerns in the British Colonies and the United States of America, &c., for the regulation by telephone of railway traffic in its many phases, such as marshalling goods traffic, arranging reliefs for enginemen and guards, obtaining stock reports, &c. In addition to its uses on railways, the apparatus has been successfully employed in the regulation of tramway traffic, mines, and in other connections where interworking is required between a number of stations and where, for economic reasons, only one pair of line wires is practical.

The principal of the apparatus is well known; a set of apparatus under the control of a controller and situated in a convenient position with respect to the railway, or tramway, &c., sends out to the telephone line a series of coded reverse-current impulses which, by a special step-by-step method, step round all the receiving selectors, one in each of the way stations bridged across the common telephone line. By a process of elimination depending on the particular code-setting of the way station to be called and that of its associated key which is operated by the controller, only one station is rung, and no other station is called or interfered with in any way. By this means as many as 78 stations bridged across a common line can be rung selectively.

The operation of calling a desired station is extremely simple; all that is necessary is to give a quarter turn to a selector key bearing the name of the station to be called, and this operation causes the bell at the station required to ring automatically. A particular feature of the system is that the operation of a selector bell in any way station produces a tone on the line from which the controller can be certain that the particular station has been rung.

The operator at the called station answers in the usual way, but owing to the heavily-loaded nature of the telephone line compared with most other telephone lines with one instrument per line, a special telephone circuit has been devised which makes it possible under the most heavily-loaded conditions of some 78 telephone stations on a long line, for all telephone sets to be simultaneously receiving a message from the controller.

A new "loud speaker" recently developed for use on traffic-control lines was also demonstrated, its object being primarily to obviate the necessity of the controller having to wear a head receiver for hours at a time as is usual practice on large railways or tramways. The "loud speaker" operates in conjunction with a special valve amplifier, the operation of which adds very little to the duties of the controller, as it is only necessary to operate a switch to bring in the loud speaker, or to change over to the operator's normal head set. The controller can then, by listening to the "loud speaker," hear the conversation of the operator at a distant way station.

The firm also exhibited the kathode-ray oscillograph that has been shown at the I.E.E. and the Royal Society. It is a special form of Braun tube employing a hot kathode in the form of a thermionic filament, and its chief advantage over other forms of oscillograph is its freedom from inertia and from free period which renders it effective at frequencies at which other forms fail—for instance, at radio frequencies. The tube is more convenient to operate than most other forms of oscillograph on account of the simple nature of the accessory apparatus needed. It allows of speedy observation of the characteristics of a variety of electrical apparatus and circuits, and is very useful and time-saving for factory-inspection purposes. For instance, it can be used for the inspection of thermionic valves, and it is possible through its agency to obtain a complete valve characteristic at a glance.

The tube has an advantage over earlier forms of kathode-ray tubes in the following respects:—Low-voltage operation with consequent sensitiveness and lack of difficulties due to high pressures; sharp spot, which renders possible accurate measurement; and constant pressure in the tube, and consequent avoidance of any pumps and other means of changing the pressure.

The piezo-electric effect was also demonstrated; as was the case at the Royal Society's Soirée, a specially-prepared Rochelle salt crystal about 2 in. long was used as a gramophone reproducer, the needle following the grooves in the record being made to set up varying stresses in the asymmetric crystal, which stresses cause varying electromotive forces to be generated internally. An associated thermionic amplifier allows the music to be heard simultaneously in a number of head receivers.

The crystal acts as a high-impedance telephone transmitter, and is particularly suitable for measuring sound waves in what may be called high-impedance media, such as water. Conversely, the effect may be utilised to measure small electric charges by measuring the stress produced, or the crystal may be used as a high-impedance telephone receiver.

Amongst the other apparatus on view was noticed a display of early types of electric discharge tubes by Dr. G. W. C. Kaye and Dr. E. Griffiths, of the National Physical Laboratory, which institution also had on view the new electric furnace that has been made for hardening and heat treating end-measuring bars, which was seen at Teddington lately and was referred to in our last issue.

Mr. S. G. Brown exhibited his Frenophone, and Mr. F. W. Davies showed a working model of the electrically-operated rolling lift bridge that carries the Great Western Railway over the River Towy at Carmarthen. It was made by the Cleveland Engineering Co., Ltd., of Darlington, and has been in use some 12 years.

Mr. Harrison Glew demonstrated his levitating magnets, while Mr. J. L. Hodgson, B.Sc., exhibited a steam- and water-flow meter having an electrically-operated distant indicating pointer, and Mr. A. C. Eborall showed a model of a new type of individual axle drive for locomotives, together with photographs of Swiss electric locomotives in which the method has been incorporated.

Finally, Messrs. A. Buston Buckley, O.B.E., and Mr. J. S. Wilson showed what they claim to be a new electric transmitter—the Telechron—for indicating water levels, signalling, &c.

For the purpose of indicating variations in water level, &c., it has been usual to actuate the indicator by a step-by-step

movement communicated by electrical impulses sent out by a transmitter operated by a float. There is great difficulty, however, in keeping the receiver and transmitter in step, which fact led Messrs. Buckley and Wilson to design the Telechron. Having proved very satisfactory in service on the Menufia irrigation canal in Egypt, the instrument is being introduced in this country by the Telechron Electric Transmitter Co. It is so arranged that the rate at which successive signals are sent is constant, and quite independent of the rate at which the float rises or the float wheel revolves; the latter might, in fact, be moved practically instantaneously through a space corresponding, say, to 50 impulses, but whilst the whole 50 would be ultimately transmitted to the receiver and recorded there, the rate at which they can be sent is fixed at a safe value by the mechanism provided, and is quite independent of the rate at which the float wheel moves.

In order that the rate at which the signals are sent shall be independent of the rate at which the float wheel moves, it is necessary to store up temporarily within the mechanism the total motion of the float wheel, subsequently working off the stored motion at a suitable rate. This is analogous to the "overtaking gear" fitted to the governor of a steam turbine, which, when the load is changed and the relay valves displaced, ultimately restores these valves to the same relative position as they had before the change of load. The "overtaking" motion is, in the present case, provided by an epicyclic gear, any displacement of which due to a rise of the float wheel is ultimately worked off by means of a ratchet wheel step-by-step motion; it in fact stores up the total "instantaneous" motion produced by a rise of the float.

The first effect of such a rise and consequent movement of the epicyclic gear is to set in operation an electrical relay which "notches round" the ratchet wheel tooth by tooth until certain relative positions of the mechanism are restored to what they originally were. The same current which operates this relay passes also through the distant receiving instrument and notches round its indicator in a similar way.

The number of impulses which it is possible to store up at the transmitting end for subsequent transmission is the number corresponding to 100 revolutions of the "counter" shaft. There would, of course, be no difficulty in making the "storage capacity" 100,000 or more, if desired. It is essential to record both rises and falls, which involves a duplication of parts, but does not necessitate the introduction of any new principle.

Should the transmission line be broken or the battery fail, the transmitter, on the defects being made good, will automatically set the receiver in step with itself. The most unfavourable case that can happen is that whilst the line is out of service, the float first rises so as to release one quadrant and then falls so much that the other is also released. In that case when current is restored to the line both the "rising" and the "falling" contacts are closed, and two conflicting impulses are transmitted to the receiver. To provide for this, the actuating mechanism of the receiver embodies a differential gear, one wheel of which is operated by a rise of the float at the transmitting end and the other by a fall of the float. If the two conflicting impulses arrive together, both wheels of the differential are moved, with the result that the index is unaffected, the one motion cancelling the other.

Of course, there are many other obvious applications of the apparatus, besides that of recording water levels at a distance. The electromechanical relay action is operated by the main current flowing through the indicator and line. No separate relays operating local battery circuits are used, thereby avoiding failures due to faulty contacts and batteries.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS AND MACHINERY IN JUNE, 1923.

THE exports during the month of June showed a decrease of £132,644 from the May total, large reductions being noted in insulated wires and cables, motors and generators, and telegraph and telephone instruments and apparatus. Increases occurred in three or four instances, notably in submarine telegraph and telephone cable which nearly counterbalanced a decline in land wires and cables. It is satisfactory to observe that the month's total is an improvement upon that of June, 1922, in spite of falling prices.

The electrical export totals for the first six months of 1922 and 1923 were :—

EXPORTS.	1922.	1923.
Electrical goods and apparatus ...	£3,707,175	£4,146,682
Electrical machinery	£2,445,915	£1,944,482
Totals for six months	£6,153,090	£5,091,114

The imports section also exhibited a decrease, amounting to £35,380, as compared with the previous month's total. This was principally due to a reduction of £30,904 in the figure for telegraph and telephone instruments and apparatus, all other items showing more or less normal fluctuations. The principal increase was that of £9,386 shown against unenumerated electrical machinery.

The electrical import figures for the first six months of 1922 and 1923 were :—

IMPORTS.	1922.	1923.
Electrical goods and apparatus ...	£615,140	£1,105,593
Electrical machinery	£662,200	£553,543
Totals for six months ...	£1,277,340	£1,659,136

The re-export total was higher than in the previous month and in June, 1922, the chief increase in both cases being the total of re-exported electrical machinery. Telegraph and telephone instruments and apparatus were also well up. There was, however, a decrease during the half-year as compared with the first six months of 1922.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for June, 1923.	Inc. or dec. as compared with May, 1923.	Inc. or dec. as compared with June, 1922.	Electrical imports for June, 1923.	Inc. or dec. as compared with May, 1923.	Inc. or dec. as compared with June, 1922.	Electrical re-exports for June 1923.	Inc. or dec. as compared with May, 1923.	Inc. or dec. as compared with June, 1922.
Electrical goods and apparatus (unenumerated)	£130,082	+ £3,610	+ £46,937	£78,439	+ £3,508	+ £43,451	£5,491	+ £747	+ £1,411
Insulated wires and cables ...	135,156	− 30,435	+ 20,586	17,356	− 571	+ 6,348	162	+ 125	+ 146
Glow lamps	30,999	+ 4,647	+ 2,353	10,139	− 642	− 1,449	317	− 454	− 211
Arc lamps and parts	2,270	+ 1,577	+ 1,084	2,174	+ 344	− 378	—	—	− 15
Batteries and accumulators ...	42,329	− 1,512	− 538	5,213	− 8,043	− 1,584	—	− 22	− 15
Meters and instruments ...	27,969	− 3,991	+ 8,849	8,277	+ 1,338	+ 3,277	280	− 490	− 269
Carbons	4,442	− 2,560	+ 1,996	4,395	− 5,778	+ 1,781	87	− 594	− 436
Electrical Machinery—									
Electrical machinery (unenumerated)	122,962	− 2,211	+ 22,304	89,019	+ 9,386	− 23,678	12,688	+ 3,250	+ 8,876
Railway and tramway motors	27,177	− 6,956	+ 8,870	—	—	—	—	—	—
Other motors and generators ...	124,777	− 58,068	− 20,003	—	—	—	—	—	—
Switchboards (not telegraph or telephone)—	9,078	+ 1,629	− 3,889	—	—	—	33	+ 33	+ 33
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	72,856	− 12,037	+ 45,881	9,281	− 5,160	+ 8,023	642	+ 642	+ 642
Submarine telegraph and telephone cable	51,230	+ 10,426	+ 6,409	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	145,504	− 36,773	+ 2,336	44,253	− 30,904	+ 30,473	2,507	+ 1,406	+ 502
Totals	£926,831	− £132,644	+ £144,175	£268,546	− £35,380	+ £66,065	£22,207	+ £4,643	+ £10,664

Increase or decrease for the six months ended June, 1923 ...	Exports.	Imports.	Re-exports.
	− £61,976	+ £381,796	− £16,557

THE ROYAL AGRICULTURAL SHOW AT NEWCASTLE.

An Electrical Review.

By R. BORLASE MATTHEWS, Wh. Ex., M.I.E.E., A.M.I.C.E., F.R.Ae.S.

FOR the first time in the history of England's greatest annual agricultural show (the "Royal"), the word "electric" occupies quite a considerable space in the index of the Machinery and Implement Catalogue. It is a straw which shows the way the wind is blowing, and the direction is seemingly favourable to the electrical industry. Evidently agriculturists will soon be talking as glibly of the "infancy of electricity" as do municipal mayors.

Out of 50 new inventions, classified as such, nine were electrically-operated machines, *i.e.*, nearly 20 per cent.

For the first time electric motors of over ¼ h.p. were employed for driving some of the machines on exhibition. Noticeable among these was the flour-milling machinery of Messrs. Thomas Robinson & Co., Ltd., of Rochdale. Their exhibit was operated by a 10½-h.p. and also a 1-h.p. electric motor made by the Lancashire Dynamo and Motor Co., Ltd. Messrs. Boulton & Paul, Ltd., of Norwich, displayed a 1-h.p. motor driving one of their chain-helice 90-ft.-deep water elevators. This firm also demonstrated some small motors driving washing machines and vacuum cleaners. The Singer Sewing Machine Co. had a large display, almost entirely devoted to a show of its latest electrically-driven sewing machines—it is significant that this company has taken advantage of an agricultural show to put forward the convenience of the electric drive.

Several electrical industrial trucks were on view. Messrs. Ransomes, Sims & Jefferies, Ltd., displayed a C3 Orwell truck with a lifting platform. This enabled the idea of the jack-lift truck, with its cheap, independent load platforms, to be carried out electromechanically instead of manually. Messrs. W. Goodyear & Sons, of Dudley, exhibited an electric industrial truck equipped with a 24-cell, 200-ampere-hour NI-FE steel battery. Messrs. Joseph Booth & Sons, Ltd., also showed a new 2-ton electrical industrial truck, as well as a 10-ton electric battery rail locomotive, fitted with a 3-h.p. electric motor and a 161-Ah ironclad Exide battery. The controller and brake for this locomotive were made by the Electro-Mechanical Brake Co.

Gaily gyrating round on its own centre was the method of display adopted by Messrs. Ransomes, Sims & Jefferies to attract attention to their electric battery run-about crane of 15 cwt. capacity. It was described as being suitable for estate work, but its price of £850 would rather militate against this, though in a factory it would soon prove itself indispensable and repay its cost in a comparatively short time. Messrs. Ransomes, Sims & Jefferies, Ltd., also showed a portable 10-h.p. d.c. electric motor for general farm work. This was mounted in a strongly-built housing box on substantial cast-iron wheels, the general arrangement being somewhat similar to that in vogue on the Continent, until the agricultural electric motor proper had been developed. A standard type of spirit level, as used on thrashers, was fitted; and chocks, as employed for scotching thrasher wheels, were provided. With this arrangement the motor could be lined up in three minutes—a very short time. The box was painted to match the firm's standard thrashers, which in itself should do much to remove the prejudice of farm hands against anything unfamiliar. On operating the starter, ventilation doors in the top side and bottom were opened—this is an improvement on the old Continental designs. Messrs. Robson & Coleman, of Newcastle, showed a motor-driven Keith fan and also vacuum cleaners and other electrical devices for the farmhouse. Messrs. Wm. Foster & Co., Ltd., of Lincoln, exhibited a circus showman's steam road locomotive, equipped with a Baxendale 160-ampere, 110-volt dynamo. Small electric light plants were shown on 20 stands.

As evidencing the very great interest that the farmer of to-day is showing in electrical applications, it may be mentioned that over 50,000 persons (nearly a quarter of all those who visited the show ground) entered the electrofarming exhibit of machinery (from the writer's farm). At busy times as many as 2,800 per hour passed through this stand, and the numbers in a slack period only fell to about 400 per hour. In addition, many thousands viewed the stand from the front without actually entering it. The chief items of interest in this electrofarming exhibit were the method of making hay without sunshine; and a portable electrically-driven thrashing machine. The former is a "curing," and not a "drying," process, and promises to make a revolution in hay-making and corn-treating. The stack is built of green grass, and is constructed with central hollow spaces, by means of which bacterial and chemical action in the stack can be controlled by the introduction of cold air under pressure, forced in by an electrically-driven Sirocco fan. The fan used was loaned by Messrs. Davidson & Co., Ltd., of Belfast. The thrashing machine consisted of a Tilling-Stevens petrol-electric chassis, to which the Greater Felcourt Co., of East Grinstead, had fitted a special body and also framing to take an electric motor. The latter drove the thrashing drum directly through a flexible coupling (arranged to disconnect at 25 per cent. overload). Other items of this exhibit included a 15-kW, 400-volt, 3-phase alternator, made by the Swedish General Electric, Ltd., and driven by an International Harvester Co.'s standard farmer's tractor. This set supplied the power required by the exhibit (which was all shown in operation). The underlying idea was that the farmer who had a tractor and could not see his way clear to buying an electric light engine, would use his tractor for the purpose. To attain this end, a patented track was shown whereby the tractor driver was compelled automatically to line his tractor up sideways and endwise. A typical overhead ring main, as suggested by the writer for farm use, was erected on the stand by the Newcastle-on-Tyne Electric Supply Co., Ltd.

All the motors shown on the electrofarming exhibit were of the special agricultural type evolved on the Continent in recent years. This evolution has taken place owing to the enormous agricultural demand that has arisen, and the consequent realisation that the industrial electric motor is not suited for farm conditions. Most of the motors were made in Sweden by the Swedish General Electric, Ltd. However, among them was one made at this firm's Walthamstow works, and therefore of special interest as probably being the first motor, really suitable for agricultural work, made in England. English makers naturally do not make this type, as they rightly say there is no demand at present. However, as a result of conversations at this show with a large number of farmers, the writer estimates that over 400 British farmers are now using electricity—about a year ago his estimate was 200.

To continue the list of exhibits, other items were a portable barrow-type 5-h.p. motor for conveniently moving from farm machine to farm machine; an electrically-operated combined churn and butter worker; an electrically-driven cream separator; a 2,300-egg capacity electric fan-operated incubator, with many novel features. In an electrically-lighted poultry run, showing the use of scientifically-designed light-distributing reflectors, the lights were switched on and off automatically by a self-winding electric clock, fitted with a 10-minutes' dimming device, to enable the birds to get back to their perches, on switching off for the night. An astronomical device was fitted to this clock to enable it to follow the earlier and later rising and setting of the sun as the seasons advanced. An electric plough was shown. There was also a wireless telephone receiver, which included new electrical and mechanical principles. This instrument has been specially designed for the farmer, so that at a low investment he can get his weather reports and time signals.

That the starting of the farmer's oil engine is not always as easy as it might be, was evidenced by the fact that one of the rare silver medals of the R.A.S.E. (only three were awarded this year) was given to Messrs. Petters, Ltd., of Yeovil, for an easy-starting device. This ingenious idea consisted of a firework cartridge, which was ignited and then inserted in a plug in the cylinder head. The flame produced served as the hot-bulb in other engines until the engine had generated sufficient heat itself to keep going. The cost of these cartridges works out at about one penny each—still an electric motor costs less to start.

As a result of conversations with many farmers, it was found that while they were thirsting for better ways of doing things, they knew very little about electricity—they generally inquired as to the whereabouts of the battery, and were astonished to find that electricity could be produced directly by an engine. Undoubtedly the information disseminated at this particular R.A.S.E. show will have a very far-reaching effect, to the ultimate benefit of the electrical industry generally.

Wireless from the Arctic.—British listeners-in may have an opportunity of tapping messages from an exploration party in the North Polar regions during the coming autumn and winter. The expedition, led by Dr. Donald B. MacMillan, has already left Wiscasset, Maine, for Ellesmere Land, to the west of Greenland, in the interests of natural history research. When the exploration ship, the *Bowdoin*, becomes frozen in for the long winter night, attempts will be made to communicate by wireless with members of the American Radio Relay League, who are scattered all over the United States. According to the *Wireless World and Radio Review*, the current issue (July 14th) of which contains interesting details of the radio arrangements, there should be no more difficulty in receiving from the expedition ship in this country than in America.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A New "Jackson" Cooker.

A cooker for small houses and flats has been designed by the JACKSON ELECTRIC STOVE CO., LTD., 143, Sloane Street, S.W.1. This appliance, which is illustrated in fig. 1, is strongly constructed in cast iron and steel. The oven is 10 in. high, 13 in. wide, and 13 in. deep, and has a 1,200-W heating element controlled by a three-heat switch. In the top is a combined grill and boiling plate, the loading of which is

FIG. 1.—A NEW "JACKSON" COOKER.

1,300 W, and this is also controlled by a three-heat switch mounted on the apparatus in a protected position. The grill will keep three or four large utensils boiling if necessary, while the grill space will accommodate three chops at one time. This cooker should meet the requirements of a family of from three to six persons depending upon the class of cooking undertaken.

A Pocket Wheatstone Bridge.

A very compact apparatus for the quick measurement of resistance has been put on the market by MESSRS. OSWALD RECORD & CO., 17, Victoria Street, S.W.1. This is contained in a polished wood case measuring 9¼ in. x 4½ in. x 1¾ in.,

FIG. 2.—A POCKET WHEATSTONE BRIDGE.

and the whole apparatus weighs only 1¾ lb. It consists of a moving-coil galvanometer; a slide wire and scale; four ratio resistances—1, 10, 100, and 1,000 ohms; a radial control switch for the resistances; a push button for the galvanometer circuit; and a high-capacity dry battery. The equipment is illustrated in fig. 2.

Illuminated Sign Posts.

It is a standing grievance with travellers that sign-posts in country roads, and indeed those in towns, become useless at the failing of the light. The boards are generally fixed at a considerable height from the ground, rendering it a matter of great difficulty to read their directions. To overcome this difficulty, the BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, has introduced an illuminated road sign. This is provided with bold lettering which makes it conspicuous both by day and by night. A typical example is that recently erected upon the Bolton-Blackburn road, illustrated in fig. 3.

The sign is made of copper, and can be attached to the usual type of post or any other convenient support. It is exceedingly strong, and consists of a massive copper box, the only movable part of which is the bottom. The letters are cut by stencil and backed with opal glass. A novel feature

FIG. 3.—THE BOLTON-BLACKBURN ROAD SIGN.

is the diffusion of the light so that the whole of the lettering is evenly illuminated. As a rule in this type of sign bright spots appear immediately in front of the lamps, but in this case the lighting is absolutely uniform. The words stand out clearly when illuminated, and they can be read at night at the same distance at which they become distinguishable in daylight. The bottom, though not wholly detachable, contains the lamps, and is so made that it can be readily drawn down without disturbing the remainder of the sign or the wiring. This gives free access to the whole of the inside for cleaning, renewal of lamps, &c.

The "Heatrae" Geyser.

Fig. 4 illustrates a new pattern of geyser which has been brought out recently by ELECTRIC FIRES, LTD., King Street, Norwich. The elements are blade-shaped and of the immersion type, having a loading of 3.5 kW. As is very necessary in

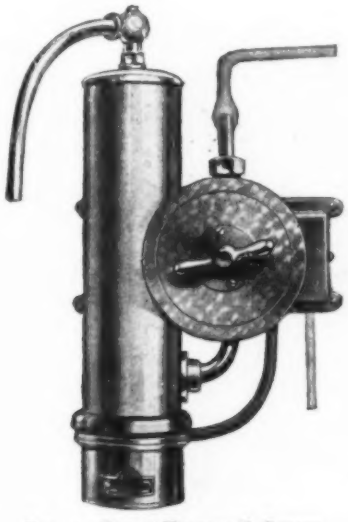


FIG. 4.—THE "HEATRAE" GEYSER.

apparatus of this kind, the arrangements for turning on the water and switching in the elements are interlocked. The handle shown in the illustration opens the water valve, and at the same time a cam fixed at the rear of the handle en-

gages with the tumbler switch controlling the elements. This ensures that the current will not be "on" while there is no water flowing. Tests have recently been carried out on the geyser at the St. Marylebone Electricity Department. The mean rate of flow was two pints in 45 seconds, and commencing at a temperature of 58 deg. F. the water was raised in 40 seconds to 80 deg. F.; in 100 seconds to 123 deg.; and in 120 seconds to 127 deg. The efficiency of the apparatus, the ratio of output to input, in B.th.u., was found to be very high, ranging from 97 to 99.5 per cent.

NEW PATENTS APPLIED FOR, 1923.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS, Patent Agents, 285, High Holborn, London, W.C. 1.

17,039. "Sparking plugs." E. Martin. July 2nd.
17,045. "Electric tramcars, &c." H. A. Mackenzie. July 2nd.
17,047. "Means for laying and securing pit tram, &c., rails." A. Walters. July 2nd.
17,082. "Sound-receiving and transmitting apparatus." E. Atherton. July 2nd.
17,087. "Variable electric contact maker." R. G. Cave. July 2nd.
17,089. "Portable wireless receiving set." H. G. Lauste. July 2nd.
17,092. "High-frequency signalling systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). July 2nd.
17,095. "Telephone receivers." G. W. Walton. July 2nd.
17,105. "Wireless, &c., signalling systems." H. P. T. Lefroy. July 2nd.
17,111. "Crystal detectors for wireless telephony." E. J. Lever and A. H. Soper. July 2nd.
17,115. "Producing electric current." C. E. Crossley. July 2nd.
17,116. "Points and switches for tramways, &c." J. Walker. July 2nd.
17,120. "Electric conductor systems." Sachsenwerk Licht-und Kraft Akt. Ges. July 2nd. (Germany, February 20th.)
17,124. "Sound amplifiers." H. L. Davis. July 2nd.
17,137. "Dual-ignition apparatus for internal-combustion engines." J. Courtier. July 2nd.
17,139. "Transparent panels for lighting arrangements." J. Cullerier. July 2nd. (France, August 8th, 1922.)
17,143. "Manufacture of electrodes of electric discharge tubes." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 2nd.
17,144. "Radio receivers." N. Ashbridge. July 2nd.
17,148. "Thermionic valves, X-ray tubes, &c." E. A. Graham and W. J. Rickets. July 2nd.
17,149. "Ballast resistance lamps." E. A. Graham. July 2nd.
17,150. "Loud-speaking telephonic apparatus." E. A. Graham. July 2nd.
17,158. "Wireless reception device." S. H. Green. July 3rd.
17,159. "Wireless signal amplifier." S. H. Green. July 3rd.
17,160. "Telephonic, &c., signal magnifier." S. H. Green. July 3rd.
17,162. "Variable electric condensers." S. J. H. Wilkes. July 3rd.
17,176. "Electric meters." T. G. P. Healey. July 3rd.
17,184. "Electrostatic separator." M. Walker. July 3rd.
17,216. "Wireless insulators and formers." F. L. Lash. July 3rd.
17,223. "Structures for supporting wireless receiving instruments." G. O. Openshaw. July 3rd.
17,224. "Terminal connectors." G. O. Openshaw. July 3rd.
17,243. "Therapeutic apparatus for producing and applying electric currents." C. Firpo. July 3rd.
17,250. "Transformers with clamped concentric coils." Akt. Ges. Brown, Boveri et Cie. July 3rd. (Germany, July 6th, 1922.)
17,251. "Anode castings for mercury-vapour rectifiers." Akt. Ges. Brown, Boveri et Cie. July 3rd. (Germany, July 12th, 1923.)
17,263. "Driving-mechanism of sound-recording, &c., apparatus." J. Ingram and W. H. Ingram. July 3rd. (Australia, July 4th, 1922.)
17,272. "Engine-starting devices." K. I. Goodman. July 3rd.
17,274. "Electric control systems." British Thomson-Houston Co., Ltd., R. D. Given, and W. J. Pool. July 3rd.
17,275. "Electric sound-producing apparatus." A. F. Sykes. July 3rd.
17,287. "Holder for electric lamps." R. R. Palmer. July 4th.
17,298. "Generation of electric energy." W. F. Graham. July 4th.
17,310. "Rotary-current distributors for internal-combustion engines." M. M. Ward. July 4th.
17,322. "Wireless systems." E. J. Capper. July 4th.
17,324. "Electric networks." Western Electric Co., Ltd. July 4th. (United States, August 9th, 1922.)
17,325. "Electric condensers." Western Electric Co., Ltd. July 4th. (United States, September 6th, 1923.)
17,329. "Electrical precipitation of suspended particles from gaseous fluids." Lodge-Cottrell, Ltd. (Metallbank-und-Metallurgische Ges.). July 4th.
17,334. "Electric controllers." English Electric Co., Ltd., and F. Morris. July 4th.
17,351. "Electric circuit controllers." R. C. Graesby. July 4th.
17,354. "Connectors for electric circuits." T. Graham-Farish. July 4th.
17,361. "Wireless apparatus." A. H. Curtis, Igranic Electric Co., Ltd., A. H. Mackley, and S. R. Wright. July 4th.
17,363. "Adjustable inductances." A. E. Brooks and Igranic Electric Co., Ltd. July 4th.
17,367. "Means for magnetisation of pole pieces of electric generators." J. H. Runbaken and W. Torrance. July 4th.
17,370. "Installation for distant control of a mobile body." N. Japolsky, M. Kostenko, C. Sabaneew, and B. Woronoff. July 4th.
17,381. "Electron discharge devices." British Thomson-Houston Co., Ltd., and W. T. Munro. July 4th.
17,395. "Electric telegraph systems." F. G. Creed, Creed & Co., Ltd., and E. A. Willson. July 4th.
17,396. "Electric telegraph systems." F. G. Creed, Creed & Co., Ltd., and E. A. Willson. July 4th.
17,415. "Crystal detectors for wireless telegraphy, &c." F. Parkin, G. Parkin, H. H. Parkin, and W. Parkin. July 5th.
17,416. "Crystal detectors for wireless telegraphy, &c." F. Parkin, G. Parkin, H. H. Parkin, and W. Parkin. July 5th.
17,418. "Wireless telephony." J. Geary and B. Phillips. July 5th.
17,423. "Track- and wheel-brake shoe for tramcars, &c." R. Burns. July 5th.
17,438. "Temperature-indicating devices." G. E. Folkes (Packard Electric Co., Ltd.). July 5th.
17,443. "Inductance coils." E. Zappert. July 5th.
17,445. "Burglar alarm." T. G. Buckingham and W. J. Joel. July 5th.
17,450. "Loud-speaking telephonic receivers." C. H. Johnson. July 5th.
17,490. "Electromagnetic transmission of power on vehicles." Hobdell, Way & Co., Ltd., and M. Payne. July 5th.
17,519. "Clips for electric cables for multi-cylinder engines." A. H. Perkins. July 6th.
17,520. "Variable electric resistances and control switches therefor." F. B. Cox. July 6th.
17,522. "Sparking-plugs." Igna Engineering Co., Ltd., and H. R. Wilks. July 6th.
17,533. "Variable electric condensers." C. E. Dawkins. July 6th.
17,570. "High-frequency electromagnetic apparatus." M. Latour. July 6th.
17,573. "Point and signal operating mechanism for double-wire transmission." A. G. Kershaw and Westinghouse Brake & Saxby Signal Co., Ltd. July 6th.
17,585. "Safety devices for mine cages, &c." O. Binon and C. Wautelet. July 6th. (Belgium, July 13th, 1922.)
17,586. "Diaphragms of sound boxes." A. H. Baker. July 6th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1921.

34,511. "Printing telegraphs." Kleinschmidt Electric Co., Inc. December 22nd, 1920. (173,505.)
34,559. "Method for multiple high-frequency telephony and telegraphy on wires." H. Sefton-Jones (C. Lorenz Akt. Ges.). December 22nd, 1921. (199,412.)

1922.

1,704. "Coil-winding machines." D. Macadie. January 20th, 1921. (199,417.)
4,961. "Magnetos." F. L. Hollister and C. A. Vandervell & Co., Ltd. February 20th, 1922. (199,424.)
5,157. "Incandescent safety lamp for mines." L. E. F. Ferrette. February 23rd, 1921. (175,985.)
5,380. "Radio-frequency signalling systems." J. Scott-Taggart and Radio Communication Co., Ltd. February 23rd, 1922. (199,428.)
7,336. "Methods for determining the direction of electromagnetic or electrostatic fields." N. Lea and Radio Communication Co., Ltd. March 13th, 1922. (199,434.)
8,081. "Train-lighting and similar dynamos." J. Stone & Co., Ltd., and A. H. Darker. March 20th, 1922. (Cognate application, 25,458/22.). (199,451.)
8,216. "Lamps for motor vehicles and the like." H. J. Simpson. March 21st, 1922. (199,456.)
8,305. "Electric switches." A. Reyrolle & Co., Ltd., and H. W. Clothier. March 22nd, 1922. (199,461.)
8,504. "Wireless telegraph receiving systems." C. S. Franklin, B. J. Witt, G. M. Wright, and S. B. Smith. March 23rd, 1922. (Cognate application, 1,332/23.) (199,471.)
8,608. "High-tension electric transformers." E. Haefely et Cie Akt. Ges. July 26th, 1921. (183,801.)
8,710. "Electric signalling system for railways and the like." Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch and Signal Co.). March 25th, 1922. (199,480.)
8,718. "Measurement of alternating potential differences." E. B. Moullin. March 25th, 1922. (199,483.)
9,320. "Call indicator circuits." Western Electric Co., Ltd., and L. Polinkowsky. March 31st, 1922. (199,509.)
9,770. "Systems of electric traction and suspension means for overhead conductors therefor." N. Clough. April 5th, 1922. (199,521.)
9,902. "Electrical insulating device for joints or connections in wires or cables." F. C. B. Chase. April 6th, 1922. (199,523.)
9,947. "Automatic circuit breakers." Crompton & Co., Ltd., and W. F. Jones. April 7th, 1922. (199,526.)
10,516. "Oil-cooled X-ray apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). April 12th, 1922. (199,535.)
11,044. "Automatic switches of the step-by-step type for use in automatic telephone systems." Automatic Telephone Manufacturing Co., Ltd. April 29th, 1921. (179,157.)
11,503. "Electric furnaces." R. A. Driscoll. April 24th, 1922. (199,546.)
11,797. "Electrical alarm switches." G. W. Wacker. April 27th, 1922. (199,548.)
11,931. "Apparatus for distributing electric current." British Insulated and Helsby Cables, Ltd., and G. H. Nisbett. April 28th, 1922. (199,549.)
12,149. "Time-signalling instruments." C. G. Lowen and C. P. Lingwood. May 1st, 1922. (199,553.)
12,174. "Magneto electric machines." H. Krebs and E. Wolff. May 1st, 1922. (199,554.)
12,553. "Alternating-current motor groups." Forges et Ateliers de Constructions Electriques de Jeumont. June 9th, 1921. (181,335.)
12,945. "Electric order telegraphs." Evershed & Vignoles, Ltd., and J. C. Needham. May 8th, 1922. (199,560.)
13,316. "Press-button switches for electrical circuits." F. Cicogna and E. Mariani. May 11th, 1922. (199,564.)
14,004. "Automatic switches for use in telephone systems." Automatic Telephone Manufacturing Co., Ltd. May 23rd, 1921. (180,331.)
14,224. "Arrangement for multiplying the frequency of an alternating current." Ges. für Drahtlose Telegraphie. May 30th, 1921. (180,672.)
15,346. "Controlling magneto electric machines." Rudge Whitworth, Ltd., and W. H. Whitmill. May 31st, 1922. (199,579.)
16,066. "Control of electric motors." E. A. Binney and Metropolitan-Vickers Electrical Co., Ltd. June 9th, 1922. (199,588.)
16,826. "Electrical metal vapour apparatus." Siemens Schuckertwerke Ges. June 18th, 1921. (181,736.)
18,050. "Switching devices particularly applicable for use in telephone systems." Western Electric Co., Ltd. July 2nd, 1921. (182,486.)
18,572. "Telephone transmitters." Western Electric Co., Ltd. October 3rd, 1921. (186,896.)
19,532. "Couplers for electrical tumbler switches." E. Wilcox. July 17th, 1922. (199,617.)
20,478. "Electric circuit controllers." R. C. Arter. September 8th, 1921. (185,722.)
25,948. "Means for securing electric fixtures." H. J. C. Forrester (J. H. O. Maleport and A. Mathieu). September 26th, 1922. (199,649.)
26,015. "Electromagnetic receivers for telephony or the like." E. Shipton. September 26th, 1922. (199,651.)
27,449. "Speed-controlling mechanism for paper making or the like machines." British Thomson-Houston Co., Ltd. (General Electric Co.). October 10th, 1922. (199,652.)
27,833. "Outdoor junction boxes for electric circuits." Johnson & Phillips, Ltd., and W. J. P. Orton. October 13th, 1922. (199,655.)
28,574. "Circuit breaker for electrical installations." L. Jublin. November 8th, 1921. (188,646.)
33,927. "Electromagnetic indicating device for railway or other purposes." Tyer & Co., Ltd., and F. W. Leake. December 12th, 1922. (199,673.)

1923.

2,652. "Telephone receivers and similar sound-producing devices." British Thomson-Houston Co., Ltd., and A. P. Young. (Cognate applications. 16,158/22 and 26,980/22.) (Divided application on 14,300/22.) May 20th, 1923. (199,678.)
4,647. "Electric motor-control circuits operated by series-parallel controllers of the tramway type and the like." W. Edwards, L. Etheridge, and J. A. Baker. February 17th, 1923. (199,680.)
4,954. "Sparking plugs." R. A. Cure. February 22nd, 1922. (193,842.)
8,326. "Automatic electric control systems." Metropolitan-Vickers Electrical Co., Ltd. March 23rd, 1922. (195,397.)
14,448. "Incandescent safety lamps for mines." L. E. F. Ferrette. February 23rd, 1921. (Divided application on 175,985.) (198,686.)